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ABSTRACT

As part of a project to improve education in the basic skills, this report reviews the research literature in order to specify skills in the areas of reading, listening, speech, writing, handwriting, spelling, and mathematics. For each area, preliteracy, basic-literacy, and career-literacy levels of the skills are discussed and summarized in chart form. Extensive bibliographies are included for each area. (AA)

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Project to Improve Education in the Basic Skills
(Reading, Writing, Computing, Speaking, and Listening)

Specifying Basic Skills
Technical Report No. 2

DOE-UF Basic Skills Project
Phase II, Contract No. R5-174

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FORWARD

The DOE-UF Basic Skills Project involved the talents of many individuals, each contributing in some way to the final product. The initial thrust for this effort was generated by Commissioner Ralph D. Turlington and Dr. Bert L. Sharp, Dean of the College of Education.

Phase II of the project was supported by the Board of Regents of the State University System through their STAR project program and the Department of Education. Mrs. Ada P. Puryear, Administrator, Early Childhood and Elementary Education, served as the technical monitor for both agencies while the work was in progress. The cooperation from both agencies was outstanding - giving guidance and support as needed.

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Ruthellen Crews and Evelyn Wenzel developed the section on the language arts; Elroy J. Bolduc and Mary G. Kantowski did the mathematic portion of the study; and William R. Powell and Lawrence L. Smith worked on the reading section of the report. In addition, Jeffrey Weathers, Adrienne Perry, and Susan Lubet provided supportive assistance to members of the university project staff.

The final document, through many revisions, was carefully prepared and supervised by Susan Walker. Appreciation is extended to all project members who participated through Phase II operations.

William R. Powell

BASIC SKILLS

IN

READING

READING

Mastering the skill of reading is a complicated task that poses many complex problems for a learner to solve. The task requires that each learner develop an ability to attach meaning to the arrays of marks distributed across the space of a page. To the beginner, this process must seem very confusing. Indeed, the fundamental basis of learning to read can be conceptualized as the movement from a state of cognitive confusion (94:71) to one of increasing cognitive clarity (30). In accomplishing this, each child gradually acquires an increased knowledge of certain essential linguistic concepts, and develops a more comprehensive understanding of the purpose and the mechanics of the reading act.

Reading is both a perceptual and cognitive task. The perceptual aspects tend to represent the more "common sense view" of what reading "obviously" is. More profitably perhaps, attention should be directed toward the less obvious or "invisible" conceptual features and the underlying principles represented by skill learning. One way to view the relationship between learning a skill, a concept, and a principle is to ask: "What is the nature of the residue that is left when a specific skill is mastered to a degree that it operates as an unconscious response?" That residue contains underlying factors which may be much more important than the surface indicators of skill identification and specification. To be a truly skilled performer, one must know at least as much about what (and why) to do as one knows about how to do.

As the studies on reading skill behaviors were read, sorted, tabulated, and listed, it became apparent that the skill behaviors selected tended to reflect a larger, more inclusive range of behavior

that together constitute a system of concepts/principles. These concept/principles are more powerful, more permeating, and more expansive than any one or two specific reading skill behaviors. The existence of a conceptual framework has been suggested by research in related areas (18, 24). Adapting this idea to reading, the organization of this report attempts to relate the specific terminal reading behaviors selected from the research, at three levels of literacy, to their respective implied concepts/principles in the areas of comprehension, decoding, and vocabulary development. These emerging concept/principles are listed in Table 1 and also appear along the left side of Tables 3, 4, and 5.

Two noteworthy properties are associated with the twenty-five concepts/principles listed in Table 1. First, each of these concept/principles represents potentially teachable skills that is based on reading research. Secondly, each concept/principle was derived from and is supported by one or more reading skills considered necessary and essential for the acquisition of literacy. These required reading skills are represented in Table 2 by a single word or a brief phrase, simply to identify them. They are more formally and completely presented in Tables 3, 4, and 5 within the categories they represent: comprehension, decoding, or vocabulary development.

In the section that follows, each of the skills listed in Table 2 will be preceded by a statement of the concept/principle that the skill or skills represent. Relevant research will be identified along with a brief discussion of the skill's characteristics.

TABLE 1. CONCEPTS/PRINCIPLES NECESSARY FOR THREE LEVELS OF READING PERFORMANCE

Pre-Literacy Level	Basic Literacy Level	Career Literacy Level
Sign. Concept Message Concept Speech-Sound Concept Concept of Order Contrastive Principle Associative Principle Flexibility Principle Concept of Word Boundaries Generative Principle Concept of a Syllable Timing Principle Literal Concept	Principle of Silence Principle of Position Principle of Variability Principle of Clustering Principle of Partitioning Automaticity Principle Principle of Transformation Principle of Inference Judgemental Principle	Concept of Minimal Meaning Units Concept of Rate Differential Principle of Search Automaticity Principle

TABLE 2. BASIC READING SKILLS AT THREE LEVELS OF READING PERFORMANCE

Pre-Literacy Level	Basic Literacy Level	Career Literacy Level
Symbol representation Print as communication process Phonemic segmentation Directionality and Position in space Discrimination Recognition Letter names Word names Letter-sound correspondences Equivalents Combining/blending Prose segmentation Pronunciation unit Automaticity - 3500 words Denotation "Wh" comprehension	Effect of final <u>e</u> Sounds of <u>y</u> Sounds of <u>c</u>, <u>g</u>, <u>s</u>, <u>q</u>, <u>x</u> Diphthongs Vowel digraphs Blend/digraph rule Inflectional endings VC/CV V/CV /Cle Automaticity - 5500 words Mood, tense, negation, voice, deletion Connotation Implied comprehension Reading to evaluate	Unity and function of morphemes Flexibility of rate Skimming/Scanning Utilizing different modes of representation a. pictorial b. schematic c. symbolic Automaticity - 9600 words

PRE-LITERACY LEVEL READING SKILLS

The pre-literacy level is a designated point in reading skill acquisition that marks an indicator level of progress toward a more durable goal of basic literacy. That point is commonly the end of primary school (K-3). There is evidence to suggest that this milestone is a level necessary for successful completion of work in the elementary school. However, from a skill acquisition point-of-view, successful performance at the pre-literacy level provides no assurance of permanent (life-time) learning. Skills learned at this level tend to be unstable and weak, lacking in consolidated strength. Without additional learning, consolidation is unlikely; and without consolidation, those skills already learned will begin to disintegrate and eventually evaporate.

The skills suggested in Table 3 offer the sub-foundation upon which a more solid framework of literacy can be built. They are the terminal skills that would be expected to produce a performance level of approximately $4.0 \pm .5$ (grade level, as measured by a typical standardized test). While these pre-literacy skills are terminal for primary reading instruction, the skills listed for the subsequent basic literacy level would also be introduced and taught during this stage of development. In reading, skill development must be continuous and overlapping.

It is noteworthy that while decoding is often highlighted and continues to receive much emphasis in early reading, the first two skills identified from research are comprehension related. Not discounting the importance of making inquiry into print, i.e., decoding, it must be remembered that meaning and cognition precede decoding and perceptual tasks.

TABLE 3. BASIC READING SKILLS FOR PRE-LITERACY PERFORMANCE

Concepts and Principles Skill Area	Comprehension	Decoding	Vocabulary
Sign Concept Message Concept Speech-Sound Concept The Concept of Order	recognize that certain shapes, designs, symbols, letters, and marks convey meaning. recognize that print (or writing) conveys the same message as spoken language.	isolate the phoneme in spoken language. recognize a word consists of a group of phonemes arranged in a special order of time. demonstrate the movement of message development unfolding in a left to right sequence.	

Skill Area Concepts and Principles	Comprehension	Decoding	Vocabulary
The Concept of Order Contrastive Principle Associative Principle		indicate particular positional relationships, i.e., <u>front</u>, <u>left</u>, <u>right</u>, <u>bottom</u>, <u>top</u>, etc. Identify the relationship of elements in surrounding space, i.e., p-q, b-d, was-saw, no-on, etc. Identify relationships among component parts (distinctive features), i.e., ascenders, descenders, oblique lines, length, curve, vowel complexity, clusters, etc. differentiate between symbols and letters which are different from others (simultaneous between class differences). provide the names of 26 letters in lower case.	Identify high frequency words without analysis or synthesis. (sight vocabulary)

Skill Area Concepts and Principles	Comprehension	Decoding	Vocabulary
Associative Principle		associate the graphemes with their corresponding phonemic characteristics.	
Flexibility Principle		relate lower case letters to the same letter in different (orthographic) form. (Equivalents)	
Concept of Word Boundaries		isolate letter(s) in a word.	
Generative Principle		isolate the word(s) in a continuous string of words.	
Concept of a Syllable		combine grapheme-phoneme elements into new meaningful units. (blending)	
Timing Principle		recognize the syllable as the basic pronunciation unit in the English language.	recognize instantly approximately 3,500 words.

Skill Area Concepts and Principles	Comprehension	Decoding	Vocabulary
Literal Concept	differentiate between sentences that make sense and those that are nonsense. respond to questions dealing with the basic <u>wh</u> framework (who-what-did).		recognize the denotative meaning of the basic sight vocabulary.

The Sign Concept: Written language represents a symbolic function and the visual symbols convey a language message.

Children must learn early that certain shapes are called letters, others are called numbers, while still others are called punctuation marks, etc. Symbols are abstract representations of ideas and objects. These abstract representations convey meaning when put in a conventional order to make up words and sentences. Children must learn that reading is a representational process, wherein visual symbols convey a message (1, 18, 29, 32, 60, 65, 72).

The Message Concept: A written form of language has a communication purpose similar to oral language.

Early in the process of learning to read, the child must learn that reading involves the understanding that "the marks on the page" are "talk written down". A child must understand that what can be said (and understood) can be written down (and read by someone). Young children need to become aware that their expressed ideas can be put on paper by using certain symbols. These printed symbols express a message in a way similar to the way that speech conveys a message (18, 29, 65, 72).

The Speech-Sound Concept: Words are made up of sounds and that these sounds occur in many different words.

Research from Russia would indicate that it is necessary to be able to isolate the phoneme (sound) auditorially in spoken language. This skill enables the student to become acquainted with the structure of the sound form of the word and this ability facilitates other

sound related tasks usually required in learning to read. The point to note in the acquisition of this skill is that the sound analysis is purely auditory; no letters are used. Through sound analysis, without symbolic association, the child is learning the phonemic (sound) structure of the language. Further, sound analysis assists the student in developing the concept of order (see below) because the process of sound analysis of a word involves the student in distinguishing the order of succession of the sounds (34, 57, 78, 89, 96).

The Concept of Order: There is an exact correspondence between the order of sounds spoken and the left to right sequence of words as printed.

Sound analysis, mentioned above, introduces the child to the concept of order when he learns to discriminate auditorially the organization of sounds in temporal succession (time) (34, 57, 89). Likewise, the student must learn to demonstrate the movement of message development which unfolds in a left to right sequence. The child must learn that the starting position of a word, line, sentence, etc. is the left and moves to the right. If the same letters or words are reshuffled they do not form the items (18, 29, 54, 66, 72).

Being able to identify crucial positional reference points are essential in the learning to read process: front (of a book), back (of a book), left (of a page), right (of a page), top (of a page), and bottom (of a page) (6, 18, 54). Without a set of common reference points the child has no functional guidance system for orienting print in space.

In addition to sequence, directionality, and positional reference, the student needs to be able to identify the relationship of elements in surrounding space. Children learn early in life that an object is that object regardless of the transformations made on the object. In other words, a chair is a chair no matter whether an arm of the chair is removed, or whether it is put on its side or turned upside down. Unfortunately, this is not true with some letters and words. When the orientation of "b" is changed, it can become a "p", a "q", or a "d". An "m" turned over becomes a "w", and "n" becomes "u" (20, 41, 66)

The Contrastive Principle: Graphemes and phonemes have unique characteristics involving within and between class differences.

Being able to differentiate within and between graphemes and phonemes is necessary in order to learn to read. The distinctive features of graphemes and phonemes are those characteristics that contrast one from another. A grapheme is characterized by a group of distinctive features that is unique for that grapheme, such as curved lines, straight lines, intersecting lines, etc. A grapheme may differ by a few or many features. Distinctive features apply equally to phonemes. Every phoneme differs from all other sounds by at least one distinctive feature. For example, the phonemes /b/ and /p/ have the same values on all features except one, voicing (4, 42, 43).

Early in learning to read, the child must learn to differentiate between symbols and letters which have class differences. Children must learn to see and/or hear the differences between

dissimilar sets. It must be learned that "h" is a letter while "+" is not; that letter combinations such as fact are a word and the combination fac1 is not. The beginner must learn to scan temporally simultaneous presentations and make a response to a difference (4, 42, 43)

Further, the beginner must learn to identify symbols and letters that display within class differences. After learning to detect with facility the differences between sets, he must learn what is the most difficult perceptual task -- a response to successive presentations. In general, it is "much easier to notice differences and points of differences between situations, than to notice likenesses and the precise points of likeness." (4:118) There is a tendency for humans to notice differences, while similarities, being a more difficult task, needs much instruction for letters, sounds, and words (4, 42, 43).

The Associative Principle: Permanent connections can be formed between repeated paired presentations so that presentation of one elicits a response of the other.

Learning the names of the letters involves paired associations. The evidence, while not without equivocation, would suggest that beginning readers would do well to know the names of the 26 letters in lower case (24, 58, 62). Lower case letters are more important in learning to read than upper case (100).

Phonics, or grapheme-phoneme associations, are essential to learning to read. Beginning readers need to learn to associate the graphemes with their corresponding phonemic characteristics. While the grapheme-phoneme correspondences of the English language

are somewhat irregular, there is enough regularity to clearly warrant the learning of the frequently occurring regular letter-sound associations (42, 43, 78). Vowel letter-sound correspondences are particularly troublesome, and need early concentration for cues to word recognition (33, 57).

Names of words are associative in nature, as are letter-names and letter-sounds. Children have to learn to call or identify a word by its "name". Initially children must learn to identify by sight a core of high frequency words. Proficient readers will be constantly adding words to their sight vocabulary so that they will not have to analyze each word as though it had never been seen before. Some words have to be learned only by sight while other words can be more efficiently learned as a whole rather than through some process of word-attack (27).

The Flexibility Principle: Certain units are equivalent so the substitution of one set of symbols for another can be accomplished without any substantial difference.

Due to the varied orthographic styles and form available in printed and written language, a beginning reader must learn that particular lower-case symbols are equivalent in form although their specific configuration is different. Lower case, upper case, manuscript, cursive, and other print styles are examples of this configurative variety that requires the reader to perceive graphemic equivalence amid orthographic differences. These equivalent sets must be learned or cognitive clarity cannot be achieved (28, 67).

The Concept of Word Boundaries: The space between words represent the end of one word and the beginning of another word.

Children, during the ages when they are learning to read, must develop an understanding of the nature of the visual units which are appropriate for learning to read, i.e., letters and words. Space or blank places are particularly confounding to beginners. They need to learn how to break visual components into segments (parts). The major signal for visually segmenting sentences is the large space between words. The determination of visual segmentation rests on the ability to isolate the letter within a word, and to isolate each word in a continuous string of words (14, 37, 53, 60, 61, 78).

The Generative Principle: Knowledge of elements and how to combine or blend these units sequentially increase production capability for forming significant pronunciation units.

Phoneme blending has a significant relationship to performance in reading. There is also a significant relationship between phoneme blending and the age of the reader and his ethnic origin, but the sex of the reader does not relate significantly to this skill (2). Beginning readers need to learn to assemble and reassemble elements into meaningful units. Effective and rapid synthesis of the known elements into a whole word is necessary for word recognition (2, 40, 58, 92).

The Concept of a Syllable: A vowel sound is the nucleus of the syllable and a word has as many syllables as it has vowel sounds.

Syllable determination is the primary basis for perceiving the visual-structural components in word analysis. When children are first learning to read, most words are one syllable. However, as the child progresses in reading, more and more words are polysyllabic. The key to figuring out how to pronounce a difficult polysyllabic word is the ability to perceive and determine the number of syllables it contains (26, 64, 73, 97).

The Timing Principle: Total reaction time represents a measure or degree of skill possessed.

For a youngster to be able to achieve a satisfactory performance at about the beginning of fourth grade level, he must be able to process instantly approximately 3500 words. This number of words is based on the data from word frequency studies (15) and the criteria for performance at the breaking point between instructional and frustration reading levels (68, 70). This criterion is based on calculation of the number of words represented in the cumulative word corpus for grade three materials at the point where frustration level would begin. In other words to make no more than 1 error in every 12-13 running words, it is necessary to have a sight vocabulary of about 3500 words.

The Literal Concept: The words in a text, individually or collectively, represent a conformity to the primary or explicit level of meaning.

It becomes necessary for a student to know denotative meanings in order to develop a literal level of comprehension. The denotative meaning of a word is the thing or things to which a name or term applies. It is difficult to derive meaning from a sentence without

knowing the meaning of the words within a sentence.

After word knowledge, the primary level of comprehension is sentence comprehension. It is necessary for a child to be able to determine if the sentence is indeed a sentence, i.e., "The lamb went to school," is a sentence and "The lamb school" is not a sentence and does not make sense. For a starting point toward understanding, a reader must be able to differentiate between sentences that make sense and those that are nonsense.

It is also essential for the student to respond to questions dealing with the basic "wh" framework. This means that a reader can answer questions about the 'who of the sentence or paragraph' and the 'did what' part of the sentence or paragraph -- the subject-predicate components. Other questions can be formed with the "wh" beginning, such as where, when, etc. These "wh" questions represent inherent units of the sentence and paragraph and signal understanding of the meaning explicit in the structural unit (7, 8, 9, 17, 21, 22, 23, 50, 74, 95).

BASIC LITERACY LEVEL

The basic literacy level is that approximate point in reading skill acquisition where the skills that have been learned become permanent and are not subject to extinction. While individual skill performance may regress somewhat, due to inactivity or lack of use, the overall skill development has progressed far enough that a consolidation of skills has occurred. This intact point is estimated to about 5.5 grade equivalent ($\pm .5$), as measured by a typically reliable standardized reading test. Further, once individuals reach the basic literacy level they can, without further external instruction, increase their own performance level. The basic level then becomes generative, enabling the individuals to function independently, if not adequately in today's society.

Nine concepts and principles are generated from the learning of fifteen skill items and together these comprise the basic literacy reading level. These skills, of course, are cumulative with respect to those terminal behaviors for the pre-literacy level. While most of the skills listed for the basic literacy level will have been introduced at the previous level, they are to be considered terminal or mastery items for the basic literacy level. These fifteen skills appear alongside their respective concept/principles in Table 4.

The Principle of Silentness: Certain letter(s) in a word are not pronounced, but are essential features in its visual structure.

The phonic generalization dealing with the effect of the "final e" in a CVCe word has been found to be a discriminating skill (59, 76). This generalization is usually stated something

TABLE 4. BASIC READING SKILLS FOR THE BASIC LITERACY LEVEL

Skill Area Concepts and Principles	Comprehension	Decoding	Vocabulary
Principle of Silentstress		determine the effect of the final "e" in sound production	
Principle of Position		determine the sound value of "y" in three different positions in a word	
Principle of Variability		determine the varying sounds of "c", "g", "s", "q", and "x", depending upon their position in a word.	
Principle of Clustering		recognize the sound characteristics of special units of two vowel combinations: diphthongs and vowel digraphs.	treat special combinations of consonants and vowels as units and not separate them for pronunciation purposes. understand the change undergone by words when the variant endings, "s", "es", "ed", "ing", etc., are added.

Skill Area Concepts and Principles	Comprehension	Decoding	Vocabulary
Principle of Partitioning		use effectively the three basic syllabification rules: 1. vc/cv 2. v/cv 3. cle	
Principle of Automaticity		apply instantly the appropriate decoding functions listed to this point.	recognize instantly approximately 5,500 words.
Principle of Transformation	understand changes in language caused by re-arrangement or shifts in meaning due to: 1. Mood 2. Tense 3. Negation 4. Voice 5. Deletions		
Principle of Inference	extract ideas from print which are not explicitly stated.		recognize the implied meaning of words with cultural shapings or within the context of special usage.
Principle of Judgement	evaluate ideas embedded in print based on standards and values.		

like this: When a word has two vowels, one of which is final "e", the first vowel is long and the "e" is silent. The studies reviewed would suggest that the skill as stated in the generalization has limited usefulness, because the percent of utility in known words was not found to be as high as judgemental criterions warranted (5, 11, 12, 13, 18, 35, 36). Perhaps the skill value of the generalization as stated is not as important itself as what it represents conceptually to the learner, namely, the principle of silentness.

Principle of Position: The position of a letter(s) in a word influences the sound represented by that letter(s).

The sound value of "y" is determined according to the position it occupies in a word. While performing as a consonant when appearing in the initial position in a word, three special cases of "y" as a vowel sound are identified by the research (45). In terms of sound value, "y" functions as a vowel in the vast majority of its usage. In the final position of a one syllable word, "y" represents the long i sound; as the final letter in a polysyllabic word, "y" usually denotes a long e sound; and when the "y" occurs in the middle of a syllable, it normally assumes the sound value of short i. The determination of the sounds represented by "y" has been indicated to be a necessary skill in learning to read. In addition to exemplifying the principle of position, "y" also has characteristics common to the principle of variability (see following) (5, 11, 12, 13, 18, 35, 36, 59, 76).

Principle of Variability: The sound value of letters, which represent sounds, changes from one word to another or within a word depending on adjacent letters, position, and silent letter influences.

It is necessary for readers to recognize and be able to determine the various sounds of certain letters. Particular letters are noteworthy and reasonably consistent in their variability. The letters "c" and "g" produce two different sounds depending on the letter that follows them (e, i, or y). The letters "s", "q", and "x" record varying sound values depending on their position in the word. The letter "s" tends to be represented frequently either as /s/ (initial position) or as /z/ (final position); "q" signifies either a /kw/ (initial position) or a /k/ (final position); and "x" typically assumes three sound values: /z/ initially, /gz/ medially, and /ks/ final. However, there are exceptions to all these typical sound representations. Nevertheless, the evidence would suggest that the skill for determining variability of sound values is necessary in learning to read (5, 11, 12, 13, 18, 24, 35, 36, 45, 59, 76).

Principle of Clustering: Special sound-letter units and combinations possess particular pronunciation characteristics.

Certain visually recognizable conventions in the English language, such as two vowel combinations, are assigned special sound values different from that which the individual blended combinations would produce. Two vowel combinations include: diphthongs (oi, oy, ou, ow), vowel digraphs (ai, ea, ee, oa, etc.) and double oo (long and short sound values). When these special

units are formed they fuse together, functioning as if they were one unit (letter), and are inseparable in syllabic division. The phonic generalization studies have indicated a varied utility rate for the functioning of these special combinations. The lowest rate of utility is recorded for vowel digraphs ("when two vowels go walking...") (5, 11, 12, 13, 18, 35, 36). Despite the seeming complexity of the two vowel combinations, acquisition of these generalizations and their exceptions is highly discriminating between competent readers and those readers in the lower 25th percentile (59).

Word variants, such as s, ed, ing, er, est, indicate a pattern of change undergone by words to reflect grammatical and syntactical relations. Learning of frequently occurring word variants adds to vocabulary wealth and aids word recognition (26, 46, 64).

Principle of Partitioning: Words can be divided into natural visual units which assist in pronunciation.

Three basic syllabication rules have been identified as increasing the effectiveness of a reader. These rules can be symbolized as the vowel-consonant vowel pattern (V/CV), vowel-consonant-consonant-vowel pattern (VC/CV), and the consonant -le (Cle) pattern. Utility studies support the reliability of these rules (5, 11, 12, 13, 18, 35, 36). They should not be confused with the spelling patterns of CVC, CVCC, etc., which are generative patterns of production in the language (if one were to computerize them). The syllabication rules are aids to analysis in pronunciation. However, recent studies would suggest that the closed syllable,

or graphoneme, is a more natural unit of aid in pronunciation than syllabication patterns (47, 51, 87).

The Automaticity Principle: Words and units must be recognized in a routinely smooth and easy fashion without conscious effort or excessive duration.

In order for a child to reach the basic literacy level, all decoding functions need to be at an automatic level. One criterion for deciding when children's sight vocabulary is automatic is when they can complete the processing of a word while their attention moves on ahead in the text. If the child has to direct attention to visual letters, their sounds, or to the blending of sounds into syllables, then attention cannot be focused on the task of comprehending the reading material. Automaticity is crucial because attention needs to be focused on comprehension (3, 55, 79).

Just as approximately 3500 words were determined to be necessary to reach the pre-literacy level, the same process would reveal that about 5500 words are necessary to achieve minimal instructional performance at the mid-fifth grade level (15, 68, 69, 70).

Principle of Transformation: A change of form, order, and structure of the elements in a sentence has a resulting change in meaning.

A substantial amount of evidence exists on children's comprehension of syntactic structures. A child needs to understand that certain rearrangements or shifts within a sentence change the meaning of a sentence. The evidence would indicate

that children, even through the age of nine, have difficulty with selected sentence constructions. The primary constructions which influence comprehension are: mood, tense, negation, voice, and deletions. Examples of each are as follows:

- (1) Changes in mood
 - (a) I hid.
 - (b) Can you hide?
 - (c) If you can hide, . . .
- (2) Changes in tense
 - (a) I hide.
 - (b) You hid.
 - (c) You will hide.
- (3) Changes due to negation
 - (a) You can't hide.
 - (b) You scarcely are hidden.
- (4) Changes in voice
 - (a) He made this boat.
 - (b) This boat was made by him.
- (5) Changes due to deletions
 - (a) Jane is learning to read. Jane is in the first grade.
 - (b) Jane, who is in the first grade, is learning to read.
 - (c) Joe, who is on my team, is quite good.
 - (d) The man on my team is quite good.

While the basic words are the same, simple transformations change the meaning of a sentence (7, 17, 38, 39, 44, 49, 52, 75, 89).

Principle of Inference: Conclusions or deductions can be made on facts or evidence which is not explicitly stated.

Understanding inferences applies to both individual words and connected prose. With words, the inference is called connotation; with prose, it is called inferential comprehension or implied meaning.

Words, of course, have a basic or denotative meaning. In addition, words acquire meanings that are attached to them, but which are not inherent in their primary definitions. These implied meanings

are shaped by the culture or receive special use in a particular context. Examples of such words are: policeman, cop, pig; girl, broad; boy, dude; house, pad; money, bread; "behind the eight-ball", "nest egg", "all strung out", etc. Understanding of the connotative aspects of these types of variation in word meaning and prose expressions is essential to basic comprehension (21, 22, 23, 44, 77, 86).

Judgemental Principle: Facts, evidence, and ideas are evaluated or judged on a given set of values or standards held.

Children must learn to constantly evaluate what they read. The good comprehender is a critical reader, continually checking the truth, logic, reliability, and accuracy of what is written. The critical reader continually tests for truth against what is not true, determines what is logical or not logical, and questions why something is said and for what purpose, etc. The evidence shows that this skill does not just happen. It must be taught. Basic literacy performance in an enlightened society depends on this skill (21, 22, 23, 77, 86, 98).

CAREER LITERACY LEVEL

Career literacy level is estimated to be a point where basic skill development and skill refinement would support an individual's entry into an occupational role. However, specific career choice will demand a different level of reading ability reflecting the difficulty of the materials common to that given occupation. Thus, basic skill acquisition plus advanced skill development are necessary for adequate occupational performance.

Career literacy performance is necessary and prerequisite to becoming a minimally literate person in American society. With a measured standardized reading achievement of about 7.5 ($\pm .5$), an individual begins entering into the career literacy level. Progress to this level will permit minimal work choice and provide the competency to meet the demands of most "survival tasks", represented in and through completion of life-sustaining forms and other common reading tasks.

Four concepts and principles supported by six skill behaviors comprise the career literacy level. These skills, of course, are cumulative to those terminal behaviors for the basic literacy level. While most of the skills listed for this level will have already or initially been introduced at the previous level, they are considered to be terminal or mastery items for the career literacy level.

The Concept of Minimal Meaning Units:

Morphemic units form indivisible modifiers of meaning to the basic root.

A knowledge of minimal (visual) units of meaning as an aid to

TABLE 5. BASIC READING SKILLS FOR CAREER LITERACY PERFORMANCE

Skill Area Concepts and Principles	Comprehension	Decoding	Vocabulary
Concept of Minimal Meaning Units		recognizes affixes (pre- fixes and suffixes) and their effect on meaning change	
Concept of Rate Differential	adjusts rate of reading according to purpose and difficulty of material		
Principle of Search	skims to gain sensory impression of organization scans material to locate specific information		
Automaticity Principle	understands ideas represented in different forms of presentation - pictorial form (pictures, signs, maps, etc.), schematic form (dia- grams, tables, graphs, schedules, etc.), and symbolic form (references, forms, printed directions, etc.) apply instantly the search functions listed above.		recognizes instantly approximately 9600 words

vocabulary development and enrichment cannot be ignored. Morphemes, i.e., affixes (prefixes and suffixes) and roots, are the smallest units of meaning in a given language. Affixes have been shown to have made a significant contribution to the level of reading comprehension (48, 83, 84). Knowledge of roots, prefixes, and suffixes can be a basic tool for word recognition. Knowledge of word parts yields stability and provides a powerful aid in understanding the meaning of new words. Although the English language contains many seldom used affixes, a small but significant number of these have been identified as high frequency units that would have positive promise for instruction (10, 88).

Concept of Rate Differential: Different reading rates are dependent upon the purpose for reading and the difficulty of the material.

One of the most profitable characteristics of efficient reading is flexibility or versatility; the adaption of reading rate to the purpose for reading and the difficulty of the reading task. In any reading activity, purpose is the guiding principle. Different kinds of material: narrative, expository, argumentative, descriptive, poetic, etc., present different styles and nuances of difficulty. Reading of each of these types is usually undertaken for the purpose of reading to learn; therefore, the generic purpose is similar in nature while the rate is different. For example, the lead story in the newspaper and the editorial page are read at quite different rates. Flexibility means that an efficient reader has many reading rates, not a single reading rate (56, 82, 85).

Principle of Search: Locating informational units in different forms of representation are necessary for accurate and efficient performance.

The ability to find needed information quickly is essential for on-the-job performance. This requires the use of the skills of skimming and scanning. In both instances the rate is similar (quick), but the purposes are dissimilar. Skimming is a reading rate for obtaining of sense of the material - to obtain a feel for the common characteristics, an overview. It is an organizational process. Scanning, on the other hand, is based on selective perception in the attempt to quickly locate specific information. It is a "looking" process. Both processes are essential techniques which contribute to an individual's ability to find and locate ideas quickly (71).

The mode or form of the material within which ideas are embedded contributes significantly to their understanding and utilization. Ideas can be presented in pictorial form (visual), in schematic forms, or in symbolic combinations. In many work situations, information is represented in arrays of spatial displays. Material is displayed in this manner to aid in the accomplishment of a task, not for learning, memory, or storage. It can be "forgotten" and then located again where necessary for job performance. Pictorial forms (visual) might be picture, photographs, globes, maps, signs, or models. Diagrams, and other combined visual and symbolic forms such as flow charts, classification tables, schedules, TV guides, and graphs are typical schematic types of representation. Symbolic forms of presenting material are combinations of visual, schematic, and linguistic types of information, such as, forms (checks, bank statements, credit applications, etc.),

references (want-ads, indexes, almanacs, encyclopedias, telephone books, etc.), and printed directions (labels, warranties, sheets on how to construct a gym set, etc.). In each instance, the key feature is the use of printed materials as a aid to (job) performance (81, 90, 91, 99).

Automaticity Principle: Words and units must be recognized in a routinely smooth and easy fashion without consious effort or duration.

For individuals to be able to achieve a satisfactory performance at about the mid-seventh grade level, they must be able to process instantly approximately 9600 words. This number of words is based on the data from word frequency studies (15) and the criteria for performance at the dividing line between instructional and frustration reading levels (68, 70). It is calculated on the number of words represented in the cumulative word corpus for grade seven materials at the point where frustration level would begin. In other words to make no more than 1 error in every 17-18 running words in materials of about mid-seventh grade difficulty, it is necessary to have a sight vocabulary of about 9600 words.

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**BASIC SKILLS
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SKILLS FOR LISTENING

PRE-LITERACY

BASIC LITERACY

CAREER LITERACY

Acuity and Perception of Sounds

- a. Able to hear sounds (of nature, of man made objects, and of language).
- b. Able to remember sounds
- c. Able to attend to sounds (focus and select)
- d. Able to distinguish hearing from listening.

Sound Discrimination

- a. Able to form tentative images (encode sounds).
- b. Able to compare sounds (like and different).
- c. Able to identify language units (word, phrase, sentence).

Acuity and Perception of Sounds

- a. Able to maintain attention.

Sound Discrimination

- a. Able to listen selectively (tune in and tune out).
- b. Able to identify common elements.

Sound Discrimination

- a. Able to hear the differences in language spoken in formal situations from that spoken in casual situation.

PRE-LITERACY

BASIC LITERACY

CAREER LITERACY

Comprehension of Sounds

- a. Able to get meaning from sounds by responding to the signalling system of language:
 - (1) by following morphological rules (i.e., plurals, tenses, other suffixes and prefixes).
 - (2) by understanding a variety of sentence-combining transformations (i.e., simple, compound and complex sentences).

Comprehension of Sounds

- a. Able to interpret more complex sentence constructions.

Comprehension of Sounds

- a. Able to listen critically to evaluate
 - (1) hearsay evidence.
 - (2) hidden assumptions in point of view.
 - (3) point of view.
 - (4) speaker's purpose and intent.

- b. Expanding the listening vocabulary to include new words and more than one meaning for known words.

- b. Able to think beyond listening (i.e., making use of meaning) to
 - (1) select facts and details.
 - (2) recall and identify sequential order
 - (3) select main idea.
 - (4) summarize.
 - (5) relate one idea to another.
 - (6) make inferences.
 - (7) follow directions.
 - (8) raise questions.

- b. Able to expand the listening vocabulary to comprehend vocabulary associated with a given career field

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- c. Able to demonstrate two-way listener-speaker responsibility (i.e., to take turns in conversation and discussions).

- c. Able to learn as well by listening as by reading to meet the demands of a given career field.

- d. Recognizes importance of listening.

LISTENING AND SPEAKING

The word "oracy" refers to the skills of listening and speaking and is parallel to the word "literacy" for the skills of reading and writing (24). To speak of oracy is to assume that the way people learn to listen and to speak is to become involved in situations in which they must listen and give a spoken response. As Wilt (26) points out, "Without a listener there is no talk. Without talk there is no listener."

There is no question that learning to communicate and to understand others' communication is the most important set of skills a person learns. The beginning of learning to listen and to speak is virtually self-taught by the child before he or she enters school. Schools, however, cannot accept that the skills for oracy are natural skills known by everyone and therefore do not require attention in teaching. A large body of research points to the fact that by listening and responding to language, children acquire oracy (listening and speaking) that is a precondition to acquiring / literacy (reading and writing).

Listening

Both the areas of instruction and research in listening have been neglected as compared with other areas in the language arts curriculum. Aside from the fact that there is a mistaken belief by some that children develop listening skills by merely growing up, the problems of defining and describing the nature of listening and of measuring and evaluating listening have led some schools to fail to give it the credibility it deserves. When teachers are asked to name a listening skill, they are often hard put to respond (13). As Lundsteen (14) points out, "Listening

is bound up with a grasp of vocabulary, with attention, factual recall, the speaker's purpose, imaging, all manner of thinking skills that do not necessarily require language symbols for operation."

The listening skills for the pre-literacy, basic literacy, and career literacy levels have been identified from three different types of research associated with listening. First, there is the research in curriculum development and teaching methodology carried out over a long period of time which gives empirical support for the selection of listening skills appropriate for teaching the various age levels. Lundsteen (14) has compiled some fifty sources on listening research and Ruddell (18) has summarized a similar number. Many of the research reports they cite were read in preparing the report and are listed in the bibliography at the end of this section of the report. Second, there is a considerable amount of research from the early sixties to the present which has been concerned with describing the various ways different people use the English language in different contexts. Although the focus of this research is on analyzing the spoken English, the implications for listening should be obvious since one acquires one's language from listening. (6, 12, 20, 25) Third, recent research which has been designed to identify the literacy demands of jobs has given recognition to the fact that learning job skills can be done by listening; thus, the demands on learning by reading, very difficult in some cases, is reduced considerably by strengthening listening skills. (21, 22)

The term "listening" has been classified into three distinct developmental stages through which listening skills might be generated (13). This classification system begins with acuity or perception of sound referring to that which one hears. The second classification is sound

discrimination or ability to sort out various aspects of sounds heard. Third, in order to give a language response to sounds there must be an understanding or comprehension of sounds. Some of the research literature refer to these three classes of listening with these terms: hearing, listening, and auding (21, 23).

To progress through the three stages of literacy (pre-, basic, and career) requires that persons begin by acquiring acuity and perception of sounds (i.e., to be able to hear the sounds around them). In addition, they must be able to remember these sounds so as to recognize them when heard again. Finally, they must be able to focus on sounds and select from them those which might need to be given attention. Thus, they move from being just hearers of sounds to becoming processors of information through careful listening to sounds.

Having distinguished the differences between hearing and listening, children move toward sound discrimination. This requires that sounds be compared and contrasted. Then the sounds take some shape or form in the ear so that listeners can recognize that, taken in parts or wholes, these sounds make some sense in the system of communication. By careful study, the listener begins to identify the elements that sounds have in common that give meaning to the listener.

Since the early sixties, there has been an abundance of research that points to the fact that the English language is spoken in a variety of ways among groups from different regions as well as among different social classes. All speakers of the English language, whatever dialect they initially acquire, learn to use several variations of these dialects on different occasions, according to the context. Soon after entering school, children unconsciously learn to listen to the varieties

of English spoken around them. They soon develop an awareness of the fact that the variety of the language spoken is determined by the context in which the language is used. Although the focus of the research in this area is on describing spoken English, it has implications for identification of listening skills since the way one speaks is a reflection of what one hears.

Thus, an important skill well-developed by career literacy level is the ability to discriminate the differences in the language used in various contexts. This is not to say that one can specifically identify by name the various changes heard in the sound system, the vocabulary, and the sentence structure used in a specific situation. However, by the time children have reached career literacy level, they are well aware that they hear one variety of language used when they are communicating in formal situations, such as in school, and another variety when the situation is less formal or casual, such as at home.

The fact that very young children respond to the sounds they hear (sound acuity) and that they soon begin to show recognition that one sound is associated with one thing and another sound is associated with something else (sound discrimination) indicates that they are moving toward understanding what the sounds mean. Young children understand adult language utterances considerably before they can produce those utterances. This fact supports the importance that listening comprehension has on the acquisition of speaking. That children are able to get meaning from the language they hear by responding to the signaling system of the language does not mean that they are able to specifically identify by name the components of the signaling system. It simply means that, as native speakers of any language, children internalize the rules

of that language as it is acquired. As children continue to listen to and to verbally interact through that language to communicate with others, they are able to interpret and use the meaning produced by more complex constructions.

Curriculum guides have drawn from research in listening to identify the importance of learning to process information and to think beyond listening to make use of what is heard (16). Thus, one must learn to listen critically so that some judgments can be made about how much of what is heard can be believed. In today's society the ears are constantly bombarded with information (fact and fantasy). One must learn to interact in a communication situation with the efficiency to identify all of the ramifications of the message rather than to solely remember the facts heard (26).

In the past few years an organization entitled Human Resources Research Organization (HumRRO) (21, 22) has compiled research and identified its implications for job-related literacy. Significant among the findings are the fact that training programs and manuals that are developed for preparing one to perform effectively in a specific job often demand that the trainees read and comprehend material too difficult for their level of reading ability. This research has found that trainees can often substitute listening for reading in such situations. This research acknowledges that the ability to comprehend language by listening surpasses that comprehended by reading in the early years of schooling. However, this gap should close by the time a child is in the seventh or eighth grade so that learning by listening and learning by reading are about equal.

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SKILLS FOR SPEAKING

CAREER LITERACY

BASIC LITERACY

PRE-LITERACY

Units of Sound (Phonemes)

Units of Sound (Phonemes)

Units of Sound (Phonemes)

- a. Able to produce all speech sounds.
- b. Able to follow rules by which the sound system operates.

Units of Meaning (Morphemes)

Units of Meaning (Morphemes)

Units of Meaning (Morphemes)

- a. Able to separate the stream of speech into meaningful units (words, phrases, and sentences).
- b. Able to follow morphological rules to produce plurals, tenses, and other word forms.

Sentences (Syntax)

Sentences (Syntax)

Sentences (Syntax)

- a. Able to speak and respond to a variety of sentences including simple, compound, complex, and compound-complex sentences.
- a. Able to increase the variety of elements in a sentence (i.e., modifiers, verbals, units of subordination).
- a. Able to extend, perfect, and control sentence forms already used:
(1) to expand sentences using modifiers, verbals, and clause within a clause.
(2) to express tentative thinking revealed by use of such words as "perhaps", "maybe", and "I'm not exactly sure."
- a. Able to use succinct means of showing relationships between ideas in sentences.
- b. Able to combine several base sentences into one more complex, concise construction.

PRE-LITERACY	BASIC LITERACY	CAREER LITERACY
<u>Sentences</u> (Syntax)	<u>Sentences</u> (Syntax)	<u>Sentences</u> (Syntax)
c. Able to use the following common sentences patterns: (1) Subject + Verb + Direct Object (Transitive) (2) Subject + Linking Verb + Predicate (Nominative) (3) Subject + Verb (Intransitive)	a. Able to increase depth and precision of meaning and to verbalize concepts.	a. Able to increase the number of words and add new meanings of words already known.
<u>Vocabulary</u>	<u>Vocabulary</u>	<u>Vocabulary</u>
a. Gradually expand vocabulary to include a variety of meanings for common words as well as add new words.	a. Able to increase depth and precision of meaning and to verbalize concepts.	a. Able to increase the number of words and add new meanings of words already known.
<u>Organization</u>	<u>Organization</u>	<u>Organization</u>
a. Able to comment freely and spontaneously, keeping to the subject.	a. Able to control, extend, and expand on pre-literacy skills.	b. Able to increase vocabulary to include specialized meanings of words related to specific jobs.
b. Able to discuss procedures and participate in problem-solving discussions.		

PRE-LITERACY	BASIC LITERACY	CAREER LITERACY
<u>Usage</u>	<u>Usage</u>	<u>Usage</u>
a. Able to share ideas and feelings in own native dialect and own inventive vocabulary. b. Able to explore, question, discover and work cooperatively in shared experiences.	a. Able to select the language needed to verbalize ideas appropriate to a given situation. b. Able to expand the range and flexibility of acquired language.	a. Able to use the social class dialect acceptable to a social or occupational group.

Speaking

In recent years efforts have been made to identify factors associated with the acquisition of children's language. Studies in the growth of language of preschool and elementary school children have revealed that language development includes some degree of imitation, but that it also follows two lines of growth: (1) children internalize grammatical rules and develop the ability to use and vary the basic structural patterns of English; (2) children use language in a variety of ways depending on a given context or specific situation.

Virtually no research is available which has specifically looked at the speaking skills needed for oracy or literacy. It seems reasonable, therefore, to generalize from the numerous studies that describe the developmental stages children follow in acquiring the speaking skills that serve them in communicating effectively at the levels of pre-literacy, basic literacy, and career literacy as defined in this report.

Studies which have looked at children's phonological development (use of the sound system) and grammatical competence (implicit knowledge of the basic structural patterns of English) are numerous and the findings are generally consistent; however, authorities in this field contend that additional study is needed. Templin (43) found that most children could produce most of the language sounds and sound patterns by the age of five or six. McCarthy (20) noted that by the time children enter first grade they have a high degree of control over the operation of the sound system. Other studies have indicated that primary grade children are able to create words in their various forms (singular-plural, verb tenses, and other word forms) (11, 25, 26, 46). They create also common

sentence patterns and expanded and elaborated sentences by using such movable sentence parts as words, phrases, and clauses (1, 2, 3, 4, 6, 9, 11, 12, 19, 21, 22, 23, 24, 30, 35, 36, 41, 44). It has also been reported that the developmental sequence in control of sentence structure extends well into the elementary grades and that sentence complexity increases with each grade level (4, 6, 9, 16, 17, 18, 19, 27, 28, 42, 44). Studies of sentences used over various grade levels indicate that sentences also increase in length as children get older. A study by O'Donnell, Griffin, and Norris (27) of oral sentences used by children in kindergarten, grades one, two, three, four, and seven supports the idea that there is a developmental sequence of complexity in sentences used. Many of the more complex sentences used in the later grades are derived from consolidating several base sentences into one more concise sentence construction having more complex syntax. In addition, upper grade children used a greater variety of sentence constructions than those used in the lower grades.

Perhaps it should be pointed out that even though children are able to use the basic structural patterns of the language, they are not able to cite English grammar rules or give definitions of grammatical terminology. The grammatical competence displayed when children speak the language is implicit knowledge used unconsciously. There is no reason for children to be able to explain or describe it in order to use it with ease.

Interestingly, research which has compared the acquisition of children's language competence among various cultural and social class groups has consistently revealed that most normal children regardless of social class and cultural differences tend to acquire an understanding

of the structure of their native language along the same continuum and at the same rate (4, 5, 15, 33, 45).

Studies which have looked at the language performance or usage point to the fact that once children internalize the underlying patterns that compose language, "vocabulary items are easy to add, and are added rapidly, as the individual's experience in his culture increases." (37 p. 9) In a 1926 study of the number of different words that children actually used in their recorded talk, Smith (39) found that there was a considerable increase from ages one to six. She recorded the number of words used by the six-year-olds to be 2,562. Other studies have found the vocabularies of children at different ages to be considerably larger than this. Smith tested students of grades one through twelve to determine the number of words they understood. The results indicated that children in grade one understood a total of 24,000 words. The average growth in total was approximately 5,000 words per year from first through twelfth grades.

Since vocabulary does increase considerably throughout the school years, it can be expected that if children are given the experiences in which they conceptualize understandings that are described in job training programs, they will be able to acquire the vocabulary to talk about these understandings (40, 41).

Other studies of language performance have indicated that as children acquire knowledge of the structure of their language, they also learn how to respond differently in different speech situations (4, 5, 14, 29, 30, 34, 46). Cazden (5) concludes that more attention should be given to the context of situations to determine the power of children's language usage. She cites several studies some of which

deal with lower-class children, others with children of mixed socioeconomic status. These studies provide evidence that children use speech appropriate to the situation. She notes, "the greater the degree of affect or personal involvement in the topic of conversation, the greater the likelihood of structural complexity." (5, p. 89)

The work of sociolinguists has clearly indicated that speakers use a number of different dialects and that many children recognize quite early how speech is influenced by the formality or informality of the situation. Labov (14) observed examples of this "style-shifting" (changing dialects to fit the characteristics of the situation) in children and adults in an extensive dialect study in New York. Shuy (34) likewise noted this style-shifting in a similar study carried out in Detroit. Many linguists and educators insist that a value judgment should not be placed on a dialect by labeling it as "wrong" or "right." They contend that whatever dialect is used should be relative to the particular context in which it is used. There may come a day when society will accept the dialect of various low socioeconomic cultural groups as appropriate for any context. At present, however, it is a brutal fact that in order to function in the mainstream of American society, to perform successfully in social, vocational, and academic circles one must be able to speak a variety of English that communicates acceptably with the mainstream. Therefore, for the present, it seems practical to set as a goal for career literacy that skill in oral language usage include maintaining the patterns of language form used in the child's home and to add to this the forms of language usage that are required in a technological society.

An important generalization which can be made from studying most of

the research relating to oral language is that in studying language or instructing for language growth, there is an interrelation of three different processes. Rosen describes them well in the following statement:

Firstly, a child must have experience of language; secondly he must have experience of the world (i.e. non-linguistic experience); thirdly he must be able to organize his thinking so that he makes sense of both kinds of experience. (30)

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WRITING SKILLS

PRE-LITERACY

Sentences

- a. Can write simple direct statements about particular happenings.
- b. Can write a caption or a simple sentence about a picture.

Punctuation

- a. Places a period at the end of one-sentence product and question mark, if appropriate.

BASIC LITERACY

Sentences

- a. Can reproduce patterns generated in speech.
- b. Can express coordination and simple subordination to express relationships (i.e. time and causality).
- c. Proofreading:
 - (1) Can identify beginning and ending of sentences by reading aloud.
 - (2) Can eliminate "and" beginnings.

Punctuation

- a. When writing is read aloud, can put in end punctuation to signal intended meaning (periods, question marks, exclamation marks), commas to separate parts of compound sentences, and quotation marks to show direct quotations.
- b. Can use commas between
 - (1) day of month and year.
 - (2) name of city and state.
 - (3) words in a list.
- c. Can use apostrophes to show possessives and contractions.

CAREER LITERACY

Sentences

- a. Has an increased control of sentence structure to create short simple sentences or more complex, concise sentences depending on the situation and the needs for entering job training.

Punctuation

PRE-LITERACY		BASIC LITERACY		CAREER LITERACY	
<u>Capital Letters</u>		<u>Capital Letters</u>		<u>Capital Letters</u>	
4. Can use capital letters to show	a.	Can use capital letters to show	a.	Can use capital letters to show	a.
(1) First letter of own name.		(1) Days of week and months of year.		(1) Days of week and months of year.	
(2) Local place names.		(2) Names of specific places.		(2) Names of specific places.	
(3) Beginning of sentence.		(3) Proofreading: Can identify omitted and inappropriately used capital letters.		(3) Proofreading: Can identify omitted and inappropriately used capital letters.	
(4) The word "I".		(4) Any proper noun.		(4) Any proper noun.	
<u>Usage</u>		<u>Usage</u>		<u>Usage</u>	
a. Reproduces speech characteristic of dialect.	a.	Proofreading:	a.	Can use written language that is appropriate to the situation and job training demands.	
		(1) Can identify and correct subject-verb agreement errors when verb immediately follows subject.			
		(2) Can identify omissions of 's' to indicate plurality.			
<u>Content</u>		<u>Content</u>		<u>Content</u>	
a. Can express an idea by drawing a picture.	a.	Can use as subject matter	a.	Can write types of letters as required for different job training.	
		(1) information gathered by firsthand experience.			
		(2) information gathered from reading.			
b. Recognizes the need to write (i.e., identifying items by own name, lists, notes, etc.)	b.	Can create a writing style in which characters interact through conversation.	b.	Can fill in more complex forms accurately and neatly.	
c. Recognizes everyday experiences as material for talking and writing.	c.	Can write simple personal letters.	c.		
		d. Can neatly and accurately fill in simple forms.	d.		

PRE-LITERACY		BASIC LITERACY		CAREER LITERACY	
<u>Vocabulary</u>		<u>Vocabulary</u>		<u>Vocabulary</u>	
a.	Can use words in writing that are used in speaking.	a.	Uses substitutes for over-worked words.	a.	Can use words required to meet job training demands.
b.	Can arrange letters in alphabetic order.	b.	Can use beginning sound of a word to locate its appropriate meaning in a dictionary.		
c.	Can arrange 5-10 words in order by first letter.				
<u>Organization</u>		<u>Organization</u>		<u>Organization</u>	
a.	Can use narration to connect events about a personal experience.	a.	Can use plot-line and sequence in story writing.		
		b.	Can order events by using a time sequence.		
		c.	Can write a paragraph that is coherent and sticks to the point.		

WRITING

Research in writing (composition), as in speaking, essentially focuses on identifying the developmental stages children follow in becoming effective writers by studying samples of writing done by children of various ages. These developmental studies generally differ only in their methods of assessing the writing sample. Among the research reports reviewed for this study, one group of reports assesses children's writing through the use of an organized count of words and structures used by children in writing. A second group describes the use of evaluation guides for rating children's writing. A third group of reports assesses children's writing by accumulating samples of their work during particular time lapses and from one activity to another. Each current sample is compared with the student's own previous writings. These three types of assessment will be described herein. Generalizations which have been made from the research for specifying the three levels of literacy--pre-literacy, basic literacy, and career literacy--will be presented.

Research Using Counts of Words and Structures

In the past ten to fifteen years, there has been considerable research which has sought to assess the development of children's writing through organized counts of the words and structures children use (16, 17, 18, 22, 27). In these studies, the sentences in the writing samples are cut into units each of which consists of "one main clause plus whatever subordinate clauses happen to be attached or embedded within it." (17, p. 737) A count is made of the number of words used in the clauses to determine the average clause length written by various age groups.

Also, the number of main clauses and subordinate clauses are counted in each sample to compute the ratio of subordinate clauses to main clauses used by children of different ages.

Research using this type of assessment has indicated that by fourth grade most children can connect main (coordinate) clauses with "and". Also, the number of subordinate clauses used in sentences increases steadily for every grade with fourth graders having a subordination index of 1.3 (that is, they write a subordinate clause three-tenths as often as they write a main clause) increasing to 1.4 in the eighth grade. The use of noun clauses is common in very early writing. The use of movable adverb clauses appears early with the ceiling reached at the middle grades. The number of such clauses is dependent upon the subject and type of writing. Adjective clauses appear early, and their number increases steadily from early ages to the writing of skilled adults. The length of clauses tends to increase with age. The average clause length of fourth graders is 6.6 words. The clause length increases by twenty percent by eighth grade (17). As children mature, they begin to delete the use of extraneous "ands" to connect main clauses. They increase their use of subordinate clauses to show relationships. They increase in control of sentence structure to use short simple sentences or concise, complex sentences depending on the situation.

Research Using Evaluation Guides or Rating Scales

Sundbye (29) cites research which identified developmental patterns in children's writing as they mature, and she presents a useful evaluation guide which she devised based on these findings. This guide maintains that early writing of children should include complete sentences

containing elements of coordination and modifiers for nouns and verbs. There should be evidence of ability to relate ideas and to show simple time sequence. Children should also be able to relate imaginative ideas and show emotion and personal reactions to events in original stories. She contends, too, that use of both statements and questions correctly punctuated are generally used by children in grades four or five (29, p. 224-227).

In the much-talked-about National Assessment of Educational Programs in Writing, Reading, and Literature, one writing sample was taken from a large representative sample of students aged nine, thirteen, and seventeen in 1969. To assess the writing samples a rating scale measuring the overall quality of an essay was used. This type of evaluation is referred to as "a holistic scoring." The scoring process requires that the raters judge the essays by comparing them only to the others in the group, giving equal consideration to all aspects including content, organization, style, expression, and mechanics.

The findings of the first reports of National Assessment in Writing has little to say for identification of literacy skills. About the best that can be said for its results is that it further reinforces the belief that there are many difficulties involved in trying to objectively assess progress in writing. As Mellon states, "Everything considered, the writing assessment produced insufficient evidence to justify our diverting additional instructional time from more fundamental problems of thought and expression to mechanical matters." (23, p. 33)

It was hoped that more precise data would come from the second-cycle results of National Assessment in Writing carried out in 1974 (25). Again, one writing sample was taken from representative students aged

nine, thirteen and seventeen. The one analysis made with these data was to compare the 1974 samples with those taken in 1969. As in 1969, the holistic scoring for overall quality of the writing was carried out. The results were that the samples of 1974 were judged poorer than those of 1969. On the 1974 samples, the nine-year-olds wrote an average of ten more words and their sentences were less awkward than those written in 1969. There was, however, a 7% reduction in the use of sentences with complex structures and a 13% increase in incoherence in paragraph writing in 1974. Thirteen and seventeen year-old-students showed a reduction in vocabulary diversity and a decline in paragraph coherence and maturity in sentence construction in the 1974 writing samples (25).

At first look, the results of the second-round of National Assessment in Writing appear drastic, but it is important to note that students were asked to produce only a single composition which averaged fifty words at age nine and 137 words at ages thirteen and seventeen. As Mellon points out in his critique of the report,

Fifty years of research in writing has shown that writing samples of 800 to 1000 words per person, drawn from at least four or five different essays, are required to achieve intra-subject consistency, and thus to be representative on a per-person basis. (24, p. 67)

Mellon further points out, "the decrease in percentages of coherent paragraphs and syntactically elaborated sentences are definitely large enough to merit concern." (24, p. 71) He notes, however, that the reduction of writing skills reported has not reached a crisis level.

As with the first NAEP report, the nature of the sampling of performance and the results of the analysis of the data make it difficult to generalize for the identification of literacy skills. Hopefully, other types of analyses will be carried out with these data at a later

date that will offer more useful implications for identifying literacy levels and for planning instruction in writing.

Research Using Comparative Evaluation

A third type of research used several writing samples from one child over a period of time or several from one age group. Samples were assessed by describing the differences among samples with respect to specific strengths and weaknesses in content (i.e. ideas and feelings) and form (i.e. punctuation, capitalization, and other conventions). In the assessment, content takes precedence over form. Significant research of this nature has been carried out by various people in the United States (1, 4, 5, 6, 10, 11, 12, 19, 20) and in England (3, 8, 14, 20, 28).

The findings of these studies consistently show that the process of writing begins when children are able to make recognizable drawings and are given an opportunity to explain their pictures, to dictate something for someone to write about them, and to shift from talking about their pictures to writing about them. Dictating their ideas and seeing them in writing is very important for children just learning to see where words begin and end. Since expressing ideas in writing is more difficult a process than speaking them, it is helpful to have children first talk into a tape recorder and the teacher transcribes the tapes so that children can see the relationships of speaking and writing (20). As Burrows, et. al. point out, "in the primary grades abundant experience in oral expression is more important in the development of ability to write than the actual writing itself." (6, p. 27)

Children begin to write about the things they see around them;

they make up stories or perhaps confide a problem to paper using the more complex sentences they use in their speech. In talking, children often invent words for objects and ideas, because their limitations in vocabulary require them to do so. This is also true for their writing. Invented words are used with the spelling of words equally as inventive. Invented words will later be replaced as children acquire the words necessary to produce the meaning they wish to express.

In children's early writings, the sentences are usually a series of simple, direct statements about particular happenings (3, p. 84). Later, children will begin to produce sentences which show speculation and attempt to handle causality. Sentences are placed in logical order to show a logical connection of the events in a story or report. More and more information is packed into the sentences through an increase in the use of coordinate and subordinate clauses to express relationships, and there is an obvious increase in the vocabulary. Invented words and over-used words become discarded and replaced by a variety of "real" words and more mature words. As greater control of present and past tenses of verbs is acquired, time sequences become better defined. In story writing, as events proceed in time, more characters begin to enter the stories and to act and react toward each other, thus, showing evidence of increasing control in manipulating characters and situations. The reporting of firsthand experiences and collected information becomes more orderly, at first perhaps carrying the essence of a shopping list, but later, shows greater fluency, description, and movement toward a focal point.

In the early writing experiences, dealing with such technicalities as spelling, punctuation, and capitalization offer many hurdles for children. Such problems are not approached directly until children

gain confidence in their ability to get their ideas down. When dictated stories are written on the chalkboard, teachers indicate a need for punctuation marks and capital letters. Later, as proofreading and editing become fairly regular activities associated with writing to be shared, the correcting of first drafts makes teaching and learning the mechanics of writing a joint effort between the teacher and the child. Hennings and Grant suggest, "By the fourth grade, children can function as independent editors quite successfully if they have a gradual introduction to editing procedures." (15, p. 151)

Odom (26) examined writing samples of children at various grade levels and identified some basic needs in capitalization. His findings are also supported in the observations of children's writing made by the other research cited herein. It is agreed that children should begin by capitalizing the first word in a sentence and the names of people and places known by children. Capitalization of other important names (i.e. days, months, names of people, and proper nouns in general) should be given stress later.

The difficulty in acquiring skill in use of punctuation is pointed out by Greene and Petty who say, "Studies which have analyzed the writing of elementary and secondary school children and of adults show that errors in punctuation persist through all educational levels." (13, p. 302)

Greene and Petty offer a suggested list of punctuation items that might be taught at various grade levels (13, p. 303). Research and observations made by experienced teachers seem to indicate that minimal skills in punctuation usage would include use of punctuation marks which signal the end of a sentence. In addition, Greene and Petty identify

some of the educational literature that relate punctuation to intonation in speech (13, p. 302). When writing is read aloud, recognition of intonation patterns is often helpful; however, these authors rightfully warn that this practice can sometimes be misleading as not all pauses signal the need for a punctuation mark. Since children do somewhat view writing as "talk written down" (given some limitations), the use of the apostrophe in common contractions and to show possession is useful to know.

The basic assumptions underlying the research using comparative evaluations are as follows:

1. To children there must be something to write about and a reason for writing. Through many concrete experiences with writing for a purpose, children come to know the practical value of writing and to appreciate why it must be carefully done.
2. Readiness of children to write and the quality of their writing is influenced by opportunities to enrich their personal experiences, by listening to stories read and reading stories themselves, by using various materials such as clay and paint and by participating in dramatic movement and music activities.
3. Children should be given ample time to discuss and express experiences and ideas orally before attempting to put them in writing.
4. Instruction in writing skills accompanies and follows continuously - provided opportunities to write for many purposes (i.e. expressive language based on sensory experiences, straightforward writing or recording of statements of facts, and others) using various forms (i.e. letters, stories, plays,

various types of reports, and others).

5. The conventions of writing (i.e. spelling, punctuation, handwriting, capitalization, and others) are subordinate to the process of getting ideas down. They are important, but standards are built through judicious correction, preferably in the individual's presence and direct instruction on specific skills. Common mistakes should be identified according to the ability of the child to understand their correction. Only after children have acquired the habit of writing with fluency and with a sense of security and satisfaction are the technicalities and conventions of writing dealt with directly and seriously.
6. Writing that is to be shared with others should be as clear as it can be made. Therefore, instruction should be given on how to proofread and to edit writing that is thought worth sharing.

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HANDWRITING SKILLS

PRE-LITERACY	BASIC LITERACY	CAREER LITERACY
a. Can copy a sentence dictated to someone who writes it down.	a. Can copy upper and lower case cursive letters.	a. Can use a preferred style of writing.
b. Can copy upper and lower case manuscript letters.	b. Can form independently upper and lower case letters using basic cursive strokes.	b. Can write in legible manuscript or cursive form depending on demands of the task.
c. Can form independently upper and lower case letters using basic manuscript strokes.	c. Can independently join letters into words.	c. Proofreading: Can correct illegible letter forms independently.
d. Can independently group letters into words.	d. Maintains legible manuscript form for occasions requiring its use.	
e. Can space words within a sentence.	e. Can proofread, with supervision, for illegible forms in both manuscript and cursive writing.	

HANDWRITING

Identification of handwriting skills at the pre-literacy, basic literacy and career literacy levels have been identified in the research dealing with issues and instruction in handwriting. The most research and the greatest emphasis in instruction have been given to the matter of legibility. Another issue which has implications for identification of skill in handwriting is the unsettled question as to whether or not both manuscript and cursive forms should be taught; and if so, when should the transition from manuscript to cursive be made. Although numerous authorities in the field have made significant contributions, the research surveyed and conducted by Anderson, Freeman, and Herrick provide a basis for most of the issues and generalizations regarding handwriting in general practice today.

Legibility

Legibility is considered the principal objective in handwriting programs. To define "legibility," a number of standardized rate and quality scales and informal checklists have been developed to describe acceptable form of handwriting for children of various ages (1, 2, 5, 6, 7, 9, 10, 13, 14, 15, 21, 26, 31). One study, however, defined legibility as handwriting that can be read with ease (2, 7).

Readiness for handwriting instruction is recognized as important for eventually achieving legibility. It is generally agreed that children achieve readiness at different ages, depending on development of fine motor coordination as evidenced by facility in using crayons, scissors, brushes, and pencils in a variety of activities. Also, interest

in writing and reading messages are important readiness factors.

(5, 10, 15, 25, 27)

Letter formation, slant, and spacing are considered important in achieving legibility (5, 7, 9, 12, 15, 26). Most handwriting programs in schools use commercial systems for guidance in instruction (1, 5, 20, 29), and there is a variety of letter form models advocated by these different commercial handwriting systems. A need for simplicity of letter form should be given consideration when selecting a program to follow (17, 31). Generally, some letters are more difficult to make than others with the letters, "a," "e," "r," and "t" accounting for about 50 percent of all recorded illegibilities (5). Children should be taught letter forms, how to connect letters and to make movements which are economical of time and effort (14). Copying to learn the formations of letters is favored over all other methods including tracing (5, 6, 9, 10, 15, 23, 26). Some studies of handwriting quality point out that most poor handwriting is the result of lack of attention to factors in uniformity which make for legibility (2). However, both research evidence and modern practice do not hold children to a particular form of handwriting but insist that once children have been introduced to and acquired skill in the production of letter forms, they be allowed to develop individuality of style (1, 2, 5, 7, 9, 10, 15). A study of handwriting in grades 6, 7, 8, and 9 indicated that one-third of the students had developed a personal style and that handwriting was legible though different from the standard taught. (8, 32)

Illegibility increases in the handwriting of older children and adults (28). A number of studies cited by one researcher (24) suggest

that reduction in illegibilities comes about from the writer's knowledge of specific malformations. Such knowledge then, is essential if older students are to independently proofread and correct illegibilities.

The future of legibility as a standard to be achieved has been examined by Groff (16). Citing extensive studies, he points to the failure to find agreement on factors significant for determining legibility, to the declining value of using writing scales, to the leveling off of improvement in writing in grades 4-6, and to the decline in quality beyond grade six when direct instruction disappears from school programs. He suggests abandoning efforts to improve legibility and looking toward technology for communication with others and for new forms of shorthand for personal needs.

Manuscript and Cursive Writing

Most school systems teach both manuscript and cursive writing. Generally, manuscript writing is introduced in first grade with the transition to cursive occurring in the late second to early third grade. Transition is fairly complete by the end of third grade (1, 5, 6, 15, 25). Most evidence indicates that manuscript is more legible than cursive, that it can be written as fast or possibly faster than cursive, and that it is easier to learn than cursive (5). The argument is made that the cursive form of writing has been traditionally the socially acceptable form of handwriting (5) and that, therefore, the pressure to teach it is inescapable.

Beyond grade six the manuscript-cursive controversy all but disappears. Objections to manuscript subside as legibility becomes a main concern (22). Standard forms give way to personal styles (32). If such styles

are in the direction of simplifying letter forms, so much the better for legibility (31). Manuscript writing, well-established as the simpler form, has advantages beyond those cited above. It is preferred over cursive by one-third of big business employers while close to 50% say either is acceptable (17). Arguments are thus dispelled that cursive handwriting is necessary for employment. Manuscript may even be a required form for older students who may be asked to print in jobs as shop workers or clerks (22). Since cursive writing may deteriorate less and be less tiring over longer writing tasks (11), proficiency that permits shift from one to the other may be desirable for writing needs of older students.

Conclusion

With current availability of typewriters, dictating machines, and telephonic devices, questions have been raised concerning the need for continuing handwriting practice (2, 16, 28). The lull in research effort in this field in recent years (2, 8, 27) may be a prelude to research that takes new directions described in Groff's futuristic speculations.

In the meantime, teachers should not be surprised to hear a discernible ground swell of demand that teaching handwriting be emphasized through the eighth grade. As Ahrens points out:

When one considers that over 1,000,000 "dead letters" accumulate in the post office every year because the handwriting is illegible, that poor handwriting on an application form often eliminates a person from consideration for a job, that illegible sales slips cause the loss of hundreds of thousands of dollars to commercial firms, the importance of handwriting becomes extremely pertinent and the need for improvement of the teaching of handwriting in the schools is a "must." (1, p. 6)

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SPELLING SKILLS

PRE-LITERACY	BASIC LITERACY	CAREER LITERACY
a. Has automatic recall of words from a high-frequency list of words needed through grade three. (Fitzgerald, 350 Most Useful Words) b. Understands the alphabetic principle (i.e., sound-symbol relationship with letters arranged sequentially in the left to right direction). c. When writing, has the ability to approximate letters corresponding to sounds in words needed. d. Has ability to copy words supplied. e. Has knowledge of spelling patterns to generate spelling of phonetically regular words from Dolch 220 Basic Sight Words.	a. Has automatic recall of words from a selected high-frequency list of ones needed through grade five. (Fitzgerald; 450 Very Useful Spelling Words) b. Can approximate independently spelling of words needed when writing so that meaning can be recalled. c. Proofreading: Can correct spelling of high-frequency words misspelled in writing. d. Can apply generalizations for adding inflectional endings and some common derivational suffixes (i.e., -ly, -y, -ful) e. Has a knowledge of spelling patterns to generate spelling incorporating high-frequency spelling patterns from among the commonest on the Durrell list of "Common English Phonograms". f. Can, under supervision, use a dictionary to spell unknown words with phonetically regular beginnings.	a. Has automatic recall of words from a high-frequency list of words needed by children and adults (Fitzgerald "A Basic Life Spelling Vocabulary for Child and Adult" (2650 words) b. Proofreading: Can locate and correct words misspelled in writing. c. Can apply generalizations for adding prefixes and derivational suffixes. d. Has knowledge of high-frequency spelling patterns needed to generate spelling of words incorporating the Durrell list of "Common English Phonograms". e. Can independently use a dictionary to spell unknown words. f. Can spell words identified as demons for Grades 7 and 8.

SPELLING: LITERATURE SURVEY

Introduction

Decisions about building spelling competency at pre-literacy, basic and career literacy levels were made by identifying research support for selecting words to be taught, teaching generalizations, and applying to writing spelling skills learned incidentally and taught systematically.

Word Selection

The selection of words to teach to children revolves around questions concerning the total number of words to be taught and their distribution among grades 1-8; which words to include in this basic list; and which words beyond the basic list to include. Research surveyed and conducted by Ernest Horn, Gertrude Hildreth, and James Fitzgerald provide bases for spelling programs generally in use from the 1920's through the 1950's. (9, 17, 19, 20, 21)

Between 1925-50 spelling textbooks included 2000-3000 words common to a number of scientifically compiled lists of words that included those most commonly used in writing by adults (Horn, 1927), by children (Rinsland, 1945), and by adults and children (Fitzgerald, 1951). Horn (21), however, recommends 2000 rather than 3000 basic words.

Questions about grade placement of these words have been raised by Hildreth (17) and Fitzgerald (9). Both discourage the practice of fixed grade placement. Fitzgerald recommends that first words for children to learn should be useful, common in speech, low in difficulty, understandable orally and recognized in reading. He provides lists of 350 Most Useful and 450 Very Useful Words that together comprise a basic core list of 850 words (9). Such a core seems a reasonable

source of "automatic recall" words at pre-literacy and basic literacy levels respectively. Hildreth (17) provides a spelling vocabulary list of 2998 high frequency words from the Rinsland Basic Spelling Vocabulary of Elementary School Children. She divided those words into six levels according to frequency of usefulness. Her supplementary list of 440 words used more commonly in seventh and eighth grades could be used for teaching or testing at career literacy level.

Given such a basic core of words, what additional ones do children need to learn to spell? Words misspelled when children write, as well as persistently misspelled basic words (demons) are recommended with various conditions attached (9, 17, 21, 24): general utility for both present and future writing and words missed by many children. Since spelling needs expand as children in upper elementary grades have more occasions for writing, Hildreth recommends judicious inclusion at these levels of less common words needed for special needs and for various curriculum areas. Such words should never take precedence, however, over high frequency ones as yet unlearned (3). Horr recommends giving attention mainly to most frequently misspelled words, and leaving easy and less important words to incidental learning (21).

Lists of "demons" assembled for various grade levels are available (9, 17). Beginning in the 1950's computer compiled word lists and word analyses (13, 14, 19) provided some support for selecting and grouping words according to basic spelling patterns rather than according to need or frequency level (11, 15, 16). Such a basis for choosing words has been challenged (2, 21).

Generalizations

Beyond selection of words to be taught, controversy over the past

ten years extends more heatedly to the usefulness of teaching children spelling rules or generalizations. Instruction in the past has been grounded in results of studies that point to the basic unphonetic nature of English (19, 20, 21) and the need, therefore, to teach most words as separate learning acts. More recent linguistically oriented studies tended to emphasize the high degree of consistency between sound and symbol (13). The Stanford studies, Phase I and Phase II (14), reported separately in a research bulletin (23), identified regularities beyond single phoneme/grapheme correspondence, when consideration is given to stress, position, compounding, and affixing. From these studies came prescriptions for cognitively based spelling programs to teach children to discover these regularities and to apply them to all words they need to spell (15, 16, 18).

The introduction of this kind of instructional program into the spelling curriculum should reduce considerably the necessity to treat each spelling word as a separate learning act in which 'excessive overlearning' is required if the words that are learned by memorization are not soon to be forgotten. (18, p. 634)

The sharp contrast thus drawn between existing and proposed spelling programs stimulated considerable controversy, varied interpretations, further research and modified recommendations. From these sources come support for the following observations and recommendations:

1. Sound-to-symbol generalizations can help young children learn to spell many phonetically regular one-syllable high frequency words, and older children to spell stressed syllables of multisyllable words (1, 24). Such generalizations include letter patterns that represent identical sounds in many words (phonograms). (6)
2. Too exclusive reliance on patterns of sound-to-symbol regularities

as defined by the Stanford studies, however, cannot be justified because:

- a. encoding is distinctively different from decoding (5, 30, 31, 32).
 - b. pronunciations vary with dialect differences (10, 25) and with context of words within sentences (7, 28).
 - c. the 200 rules, or algorithms, needed by the computer to arrive at "regular" spellings are too many for children to learn. Results of teaching some of them to upper grade students, moreover, do not support their value for spelling words new to students (29, 33, 34, 35).
3. Children need to learn whole word (visual techniques) as well as sound-symbol generalizations (phonological techniques), so these techniques must work together rather than compete with each other. Questions about how are more important than whether to use them (24, 26, 27, 29, 32, 34).
4. Children learn how to spell as well as being taught how to do it. Before spelling is taught to young children, they arrive at their own generalizations that are often different from those taught later. Children at all ages learn to spell automatically some words as a by-product of reading and writing (34, 35). These findings suggest that teachers give credit for increasingly more accurate approximations of correct spellings at pre-literacy and basic literacy levels, rather than expecting full conformity to standard spellings that becomes increasingly possible at career literacy level.

5. Lexical as well as phonological regularities should be recognized and taught to children, i.e. instead of overusing pronunciation to dictate spelling, teach children to recognize variant forms of the same word (4). Students at career literacy level whose writing needs are likely to include an increasing number of variants of the same word (president, preside, presidential, presidency) should learn the underlying regularities that can help them spell more confidently, and perhaps even more correctly! Brengelman suggests that recognition of such regularities can alleviate spelling problems attributed to dialect differences (2). That dialect differences do cause misspelling because students rely on pronunciation has been established (10, 25).
6. Students should be tested, not just on words on a list, but on the generalizations that these words provide opportunities to teach, i.e. "this test should involve words not studied in the lesson, but subject to correct spelling if the generalization is known." (27) This recommendation seems especially applicable to the teaching of spelling at career literacy level.

Application to Writing

Discrepancies between spelling performance on list tests and on application in writing have long been observed. Reasons include poorly developed spelling conscience (22), difficulty for children to proofread (21), and failure to teach specific skills needed to use the dictionary to correct misspelled words (29). One study (29) suggested limited value of the dictionary for correcting spelling errors until children are able to learn these specific skills. On the career literacy level such skills should be taught and practiced to the point of mastery: "It is important that pupils at the upper levels seldom be given the correct spelling of a word by the teacher; they should be expected to go to the dictionary

for such information." (12, p. 215)

While direct instruction in spelling is necessary, teaching it in functional writing in all curriculum areas provides motivation for proof-reading and encourages incidental learning of words outside spelling lesson time (11). For most children teaching spelling functionally through writing is more effective than systematic instruction in grades 1 and 2 (17, 21). At these levels children's "invented" spellings should be understood and respected (33).

Systematic instruction should continue beyond the elementary grades. Such instruction at career literacy level should aim not at mastery of a specific body of words, but rather at more sophisticated understanding of the English language as it relates to spelling: dictionary making, word building by affixation that includes meanings of foreign affixes, and the nature of spelling "demons" (12).

Conclusion

Research both generates and thrives upon controversy. Researchers, likewise, are stimulated by it. Controversy is more likely, however, to frustrate and confuse classroom teachers, particularly when researchers rush too hastily into prescriptions and production of materials. A good part of the value of the Stanford research lay in the stimulation it is providing for further research, and in the thoughtful and varied interpretation it is generating--rather than in the programs and materials it spawned. At the present time there is available information culled from the best of past and recent research in spelling that may be usefully applied in classroom practice, provided it is put in a form to make sense to non-researchers. Personke and Yee (29) have synthesized past and current research and have provided a model that makes applications to

teaching that are practical, and thought-provoking, if not couched in easily understood language. A few researchers are themselves suggesting that teachers, given the information, make decisions about applications to classroom practice (35). One of them says, ". . . he who has never taught even one child to read and write should certainly be reticent in offering advice to those who have made it their career."

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BASIC SKILLS
IN
MATHEMATICS

1

MATHEMATICS

At one time the systematic teaching of mathematics was deferred until the middle grades. There is now, however, general agreement that systematic teaching of mathematics should begin in grade 1, if not in kindergarten (63). There is evidence to show that those students who begin formal study of mathematics do achieve higher test scores than those whose formal study is delayed (5), although as recently as 1958 one study concluded that formal instruction in mathematics should be delayed until grade 5 (49). There is also some evidence to show that children can learn more mathematics than they are now expected to learn (5, 53). It has been fairly well established that any one topic can be studied with success at several different levels. The experimental "new math" programs of the 1950's and 1960's (UICSM, SMSG, Ball State, etc.) showed that many topics normally taught in higher grades could be introduced successfully to elementary school students. There might be some argument as to whether the fact that they can be taught always implies that they should be taught, however Sesame Street and other nursery school type programs were based on this idea and it's been shown that children who experienced these type of programs do better later.

Basic Skills In Mathematics

The National Advisory Committee on Mathematical Education (NACOME) (33) noted that over 30 states now report some form of mathematical goals or objectives--in 12 of these states the objectives were developed in a response to legislative accountability mandates and in 15 states the objectives are related to a regular assessment program.

The specificity of the various sets of objectives varies widely. For instance, in Pennsylvania one of the Ten Goals of Quality Education states simply:

Quality education should help every child acquire to the fullest extent possible for him mastery of the basic skills in the use of words and numbers (60).

At the other end of the specificity continuum, the Michigan Minimal Performance Objectives for Mathematics are arranged in a detailed hierarchy for Grades K-9 with objectives like:

Given a set of labeled fractional cut-out parts including several units wholes, the learner will demonstrate the result of adding two mixed numbers with like denominators of 2, 3, 4, 6, or 8 by fitting appropriate parts together and writing the sum as a whole number and a proper fraction (28).

NACOME did not propose a list of objectives or goals and did not make an endorsement of any of the established lists. The committee did, however, offer both praise and caution on the establishment of such lists:

. . . identifying specific minimal goals for mathematics instruction can help assure that important objectives are not overlooked and that reasonable instructional effort is devoted to those objectives. (33)

They also note the potential drawbacks of a focus on minimal objectives:

First, the objectives intended as a minimum for mathematical achievement can all too easily become a ceiling also . . .

Second, focus on minimal skill goals can inappropriately constrain planning for instruction by suggesting that skills must be acquired in a rigid sequence of mastery learning steps. Though arithmetic computation is important for problem solving one need not achieve complete mastery of arithmetic before encountering meaningful problems.

Third, in a cumulatively structured subject like mathematics, it seems highly unlikely that fundamental concepts and skills will be passed over by instruction reaching for higher goals (33).

NACOME challenges any uncritical acceptance of engineering or management modes as the best models for educational practice.

With the above cautions in mind, the proposed list of mathematical skills for the categories of pre-literacy, basic literacy, and career literacy have been broadly classified into two categories:

1. Number Concept Skills

2. Geometric and Measurement Concept Skills

Included in the "number" category are abilities related to numeral recognition and writing as well as to computational abilities. The "geometry" category includes skills related to shape and form as well as skills related to measurement. The two categories are not mutually exclusive; as the skills become more complex there is a pronounced overlapping of the two areas.

Mathematics skills are generally acquired in a progressive manner, in steps or stages. Counting, grouping, perceiving number of object without counting appear to reflect such developmental stages (39).

Research on Basic Skills in Mathematics

The findings of educational research have not had much impact on curriculum decision making in the basic skills for mathematics. In the United States research studies on the basic mathematical skills have been predominately "instructional studies," and most research is still conducted at the doctoral level by "one-shot" researchers. There is a continual attempt to ascertain the "teachability" and "learnability" of various topics. The question asked by researchers is often "does program X promote learning better than program Y?" The studies are helpful in determinations of "how to teach" and "can it be taught" rather than in determining "what should be taught." As stated earlier there is evidence that any one topic can be taught successfully at any one of several levels. This knowledge is not enough in view of the pressures for time and efficiency - the question should be one of optimum placement.

In the late 1950's and early 60's there was great emphasis on research studies involving the teaching of sets and non-decimal numeration. Studies showed that a variable base abacus was effective in teaching non-decimal numeration systems (17) as was the use of a number base among a mythical group of people (22). These studies demonstrated that the topic (non-decimal numeration) was teachable and learnable. It has not been possible, however, to demonstrate the relationship of sets and non-decimal numeration to increased understanding of our numeration system (50). This type of study is not popular at the present time.

One study did attempt to make a comparison of content placement in an experimental text [MSG] with certain findings from learning theory. The study reported that the geometry placement did not agree with Piagetian studies on the learning of linear measure(17).

In an effort to determine evidence of the content of basic skills in mathematics the review of literature was expanded to include studies by learning theorists and mathematics educators abroad. Surveys (though most were not of recent origin), status studies, and the work of several national committees were included. The committee reports surveyed were those of the National Advisory Committee on Mathematics Education (33); National Longitudinal Study of Mathematical Ability (NLSMA) and the National Assessment of Educational Progress (8,30). In particular, for a mathematical knowledge or skill to have been included in the NAEP it had to have been considered by scholars, laymen, and educators as something that should be taught in American schools (33).

The material children already know upon entering school, and the

mathematics people use outside of school are important considerations in preparing a list of basic skills. The next two sections report such findings.

What Do Children Know About Mathematics Upon Entering School

As stated earlier, children can learn more than is now expected of them. Surveys of the knowledge possessed by children when they enter school are evidence of this. Surveys have been used to determine entering behaviors of students and the results of several of these are reported below. The next paragraph contains a set of findings which is a compilation of several studies conducted prior to 1960 (2, 3, 6, 20, 29).

Studies have shown that most kindergarten children can count and have some understanding of ordinal numbers [first, second, third, etc.] when they enter school. The counting ability varied from a mean of 19 in one study to mean of 40 in another. Several studies report that 25% of kindergarten age children can count by ten's and some by two's, four's, and five's. One study showed that 85% could write the numerals to five and 80% to six and another study showed that 45% recognized all numerals through ten. In general young children are familiar with measurement terms and instruments (rulers and scales) though they apparently are more familiar with money than with other measurements. Most children seem to have an intuitive grasp of the fractions $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$, and some recognition of geometric shapes. About 50% recognized time on the full hour. One study noted that 31% of the kindergarten children tested were above the "norm" necessary for beginning systematic instruction in arithmetic (13).

The results of a study completed in 1970 follow (44,45).

Numeral Identification. More than 75% could identify one-digit numerals; the numerals 10-13 were more difficult; and less than 25% could identify the numerals 14-21.

Sequences. More than 75% were able to continue the counting process when the cues 1, 2, 3, and 5, 6, 7 were provided. Generally students were more competent in responding to what comes "after" than what comes "before".

Cardinal Number. Over 75% had skills in the counting and recognition of small groups.

Ordinal Number. Less than 50% of the subjects responded correctly to tasks requiring concepts of second, third, and fourth.

Money. Over 75% could identify a penny, nickel, and dime.

A quarter and half-dollar were more difficult to identify.

Over 50% identified \$1.00, \$5.00, and \$10.00 bills. Less than 25% of the subjects were able to make change correctly.

Measurement. Over 75% could discriminate between size and weight. All of the subjects were able to identify a clock and a few could identify half-hour settings. Less than 25% did not know day of the week and the month of the year they were being tested, and less than 25% did not know their birthday. About 50% were able to identify a ruler and knew its use - 20% were able to use a ruler to measure the side of a card.

Shape and Size. Over 90% could match a shape with its illustration on paper. Determining number of sides or corners was more difficult than just identifying them.

Basic Literacy and Grade Level

An attempt was made to stay within the framework of having basic literacy skills within the 4-5 grade level limit. In mathematics, this limit must be stretched somewhat. For example, one basic literacy skill included is "determines the 'percent of a number'." This skill is needed to figure such things as taxes, discounts, and interest. This skill also requires multiplication by (at least) a two digit multiplier and a limited knowledge of decimals. These skills are rarely achieved by the end of grade five. Only 32% of teachers reported teaching decimals in 5th grade in a 1960 survey (18). Mathematics is regularly taught in a "spiral fashion" with the skills introduced at various levels of complexity in several different grades. The basic-literacy skills are (in general) all introduced by grade five. For example, an extensive survey of arithmetic in Tennessee showed that all topics mentioned are covered by grade five, (18) but one should not infer that mastery of all topics is accomplished at this level.

What Mathematics Is Used

When arithmetic is taught as a skill that has practical value and is useful in out-of-class situations, attitudes become more positive (13, 24, 26, 57). Three surveys of mathematical usage indicate that money, measurement, and time are the most used concepts and that games and shopping provide greatest occasion for use.

Pre-Literacy Skills

Identification of Numerals

The identification of the digits 0-9 is, of course, basic to any

further work in mathematics as is the concept of place value - the way in which the digits are combined to form new numerals.

The implications from most studies on numeral identification are that numeral writing must be taught (or retaught) at each grade level and the need for legibility must be stressed. The most complete studies on writing numerals were conducted in the 1930's and indicate such things as the fact that the numerals 5, 8, and 2 are the most difficult to write and that 0, 9, and 7 are easiest (15, 38). One more recent study showed that kindergarten children can learn to write numerals legibly but this did not lead to any increase in the students computational ability.

A growing body of research in mathematics education is related to the work of Jean Piaget and contains a wealth of information on the concept of number and its related abilities. Piaget noted how the understandings of the construction of the integers and the relationship of parts to a whole were necessary skills for the ability to add and multiply (40, 41).

Conservation of Numerousness

Conservation of numerousness is one of the Piagetian concepts and appears to have a direct relationship with early success in mathematics and has recently been suggested as a basis for a readiness test for first grade mathematics. Piaget pointed out the relationship of the ability to determine a one-to-one correspondence to the concept of quantification in mathematics (41).

Counting

It has been stated that, from a mathematical point of view, the cardinal numbers are standard sets of a particular kind - e.g. $5 = 0, 1, 2, 3, 4$. From this viewpoint the relations "as many as,"

"more than", and "fewer than" are basic to the development of number (62).

There is evidence to show that good counting facility is an aid in effective learning of the basic addition facts. The idea of finding "one more than a given number" has also been shown to be an important skill for additional learning. From Piaget's analysis of children's mental process, he has concluded that the development of the concept of number is a synthesis of the operations of class inclusion and order (40, 41).

Operations with Number

The basic facts (one digit addends or factors) are the building blocks for all computational abilities. There are certain techniques available from the literature that may be used in making learning these facts more efficient. Several addition techniques are given below as examples.

Easiest combinations were those in which 1 is added to a larger number (25).

Adding a smaller number to a larger is easier than the reverse (25).

Informal knowledge of the commutative property is an aid to learning the facts. (Children drilled on 50 facts - e.g. $4 + 2$ but not $2 + 4$ - did as well as children drilled on all 100 basic facts) (25).

Concepts of Measurement

Measurement has been described as "a process whereby a number is assigned to some attribute of an object" (56). In this paper, measurement without number has been included as a category in order to keep the terms "metric" and "nonmetric" geometry from being confused with the metric system of measurement.

Classification exercises give the student the opportunity to focus on particular attributes without formal study and the idea of

seriation whereby a student orders a set of objects according to some attribute has been studied extensively by Piagetian researchers. The latter skill requires a knowledge of transitivity and it has been shown that conservation precedes transitivity (54). If we assume a learner has established a relationship between A and B, then B (or A) must undergo some transformation before B can be compared with C.

Significant relationships have been found between a child's level of achievement and his ability to conserve, seriate, and classify (48).

Number concepts precede the concept of length in development (it is more difficult to deal with a continuous element than with discrete objects) (52). Ordinal and cardinal numbers (and thereby counting) are inextricably bound up with rudimentary aspects of length (56).

The skills in pre-literacy generally follow the first two of Piaget's four main stages.

1. Sensory-motor, pre-verbal stage
2. Preoperational representations

The Basic Literacy skills are in general representative of the third stage, concrete operations with some touches on phase four - Formal Operation. The fourth stage is probably the "Career Literacy" level, since deductive reasoning and application of knowledge are involved.

Basic Literacy

Concept of Number

The basic literacy level does not specifically introduce decimal notation but does include 'money' skills and 'percent' skills both of which do require knowledge of decimal notation and concepts. At this level place value has been extended to the thousands place with the idea that additional places should be generated. Questions on the NAEP did expect people to be somewhat familiar with millions (8).

Each day, the American consumer encounters problems that may be solved by the application of elementary mathematics algorithms. The shopper is faced with selecting the best bargain for commodities, with having to decide whether to make a cash or credit purchase and with having to pay sales tax and parking fees. Wage earners must calculate income taxes and property owners are assessed taxes on their real estate (8). The basic literacy skills reflect these problems. Check writing requires the writing of numerals in symbols and in words. Making change and figuring cost require addition and subtraction and paying taxes and figuring interest requires multiplication, percent, and ratio.

Tables and graphs are being used generally in newspapers, magazines, and even television as well as in tax forms. The ability to read and interpret these tables and graphs is becoming an increasingly important aspect of life. Much of our information comes in the form of statistics - means, majorities, odds, etc. so some basic skill in this area is also needed (30). Despite the caution made earlier as to the need for studies on the optimal placement of topics rather than just a reliance on the fact that a topic can be taught, the studies below do show that the topics included in the basic literacy can in fact be taught early in the mathematics curriculum. In general these studies show that the topics can be introduced at a earlier level than in our present custom.

Studies have reported success in teaching percentage in grades 4, 5, 6, and ratio topics in the same grades (26). Other studies have shown that many geometry concepts can be taught to young children. (10, 12). An understanding of mean and mode was shown to be possible

for children in grade 4 (7) and concepts in probability were found to occur from the child's environment (31).

Problem solving is a most important ability in order for learning to be self generating. Most problem solving studies indicate that students often give little attention to the actual interpretation of the problems; instead they almost always randomly manipulate numbers (9, 57). Direct teaching of reading skills and vocabulary directly related to problem solving improves achievement (64).

In actual practice one encounters a problem and then collects the data to solve the problem. There is some evidence that achievement is slightly better when, contrary to textbook practice, the question is asked first in a problem (65).

Topics Not Included - but must be thought about.

Any curriculum design is based on a prediction of the type of information that will be most useful to young people for many years after the time of instruction. We live in such a technologically changing world that it is hard to have confidence in any very specific list of essential skills (33).

In 1976 student access to computers and electronic calculators is growing rapidly. Over 58% of secondary schools now make some use of computers (up from 34% in 1970) (33) and for under \$10 students can obtain a dependable tool which will perform all the operations of arithmetic.

If mathematics education takes full advantage of the technological capabilities, NACOME envisions that the elementary mathematics curriculum will be restructured to include a much earlier introduction and

greater emphasis on decimal fractions - the language of the calculator (33).

The NACOME report notes that as students experiment with calculators they will also encounter concepts and operations involving negative numbers, exponents, square roots, scientific notation and large numbers. These ideas will then become unavoidable topics of elementary school instruction (33).

An exploratory study in the Berkeley, California public schools indicated that performance of low achieving junior high students on the Comprehensive Tests of Basic Skills improved by 1.6 grade levels simply by permitting use of calculators (33).

The implementation of the Systeme International d' Unites more commonly known as the metric system is just beginning to be introduced in schools. The shift to decimal representation of measurement (as in "calculators" above) will cause a change in the importance of traditional arithmetic skill with common fractions (33).

Career Literacy

The career literacy level was described earlier as the point at which basic skill development and refinement would allow an individual to enter an occupational role in society. The mathematical skills discussed in this section are those most closely associated with the concept of an entry level - the skills necessary in order to move on to specialized, technical, or professional levels.

The United States Department of Health, Education, and Welfare has partitioned careers into fifteen clusters (59). Even though an absolute common denominator of mathematical skills is virtually

impossible to find due to the diversity of the fields represented, the skills discussed in this report do represent a foundation for the careers included in a majority of the clusters. Mastery of these skills will give a student greater freedom of choice in selecting a career. Moreover, all mature citizens should possess minimal competencies in consumer and homemaking education in order to live independently and to be able to make the wisest final decisions with regard to purchases, investments, insurance, taxes, etc. without having to depend completely on others.

The search for the answer to the question "How much mathematics is a "must" for every citizen?" is not new. In 1945 the National Council of Teachers of Mathematics appointed the Commission on Post-War Plans and charged it with the task of answering this question (35). In 1970 a second committee appointed by the NCTM also attempted to define minimum competencies in mathematics (37). These committee reports, the mathematics report of the NAEP, (34) and a report by Bell of the University of Chicago (1) are some of major efforts in the establishment of a set of competencies for "mathematical literacy". Extensive use of these reports was made in the preparation of this section of this report.

The career literacy skills described in this report are built on the pre-literacy and basic literacy levels and presuppose their mastery. The obvious interrelationship among the reading, language arts and mathematics skills become more pronounced at the career literacy level. The skills reported encompass the social mathematics classification described by the NAEP as the skills necessary for personal living and effective citizenship in our society as well as the elementary level of technical mathematics as determined by the

NAEP staff (34).

Another study used in writing this report attempted to (1) identify which of 66 basic mathematics skills are requisite to success in selected vocational education courses and (2) identify those skills in which students are least prepared. The basic operations (addition, subtraction, multiplication, and division) of whole numbers were the top four needed skills reported. Finding the volume of a sphere, pyramid, and cone were the bottom three skills. The skills that were judged to be most in need of remediation include use of fractions and decimals, ratio and proportion, percentage, and reading a rule (23).

There is a heavy emphasis on computational skills in the three literacy levels. In a survey conducted by the National Council of Teachers of Mathematics, 68% of the respondents agreed that arithmetic computation is the major goal of elementary and junior high school mathematics teaching and 84% agreed that speed and accuracy in computation is essential for a large segment of business and industrial workers and intelligent consumers. Two other results of note are that 61% agreed that weakness in computational skill is a significant barrier to learning of mathematical theory and applications and that only 48% agree that computations with rational numbers should be largely confined to decimal fractions (36).

Identification of Numerals

A limiting value for reading and writing numerals is by its very nature an arbitrary decision. The value of one billion used here agrees with the value chosen by the NCTM Committee on Mathematical Competencies (37). A decimal position of thousandths

appears to be sufficient for measurement and calculation purposes.

Operations With Numbers

The skills listed in this section are also suggested in the NCTM Reports (35, 37) in Bell (1); and in the report on skill needed for vocational education (23). Problems requiring these skills were used in the NAEP. Care must be used in testing for these skills. These are intended to refer to "practical" problems rather than to more complex ones. Examples of problems are given below in order to help to set a level of complexity.

- (a) Performs all basic operations with positive rational numbers.

Students should be able to perform the basis operations (+, x, -, ÷) on whole numbers and decimals. Problems involving fractions should emphasize commonly used fractions such as those which arise from measurement. Problems such as $\frac{17}{19} + \frac{19}{91}$ are not the type intended.

- (b) Able to change decimal fractions to common fractions and conversely.

This skill should refer to problems such as $\frac{1}{4} = .25$ $\frac{3}{4} = .75$ $\frac{2}{3} = .667$ etc. rather than an attempt to find a fractional representation for rational numbers such as $0.2364\overline{343}$.

- (c) Able to solve "percent" problems.

"Percent" problems are basic to many consumer and business problems. Problems such as taxes, interest, installment buying, discount, and investment returns all require the use percent. These are the type problems which should be stressed.

- (d) Solves problems involving ratio and proportion.

There are many examples from cooking, building construction, sports, sewing, etc. which require the use of ratio and proportion.

Constructing scale drawing and determining measures of real objects from scale drawings also use the concepts of ratio and proportion.

Measurement

Many of the NAEP involved only recognition or recall of names for various plane and solid figures. Solids appear to be most less recognizable than plane figures, for example only 21% of 13 year old students were able to identify a sphere. The basic concepts of length cause difficulties at all age levels - when 9 year old students were asked to measure a length longer than the ruler supplied only 48% could do so whereas 82% demonstrated they knew how to use a ruler.

Angle measurement is included at this level in agreement with the NCTM list of objectives (35).

Some of the released exercises in the National Assessment tests include decision making as a result of computations related to the above objectives. Among these are selecting the best bargains and deciding on cash or credit purchases. A large number of exercises emphasize graph and chart reading and construction. The preponderance of such exercises affirm the importance of career related skills that can be included under the blanket of the "basic statistics" skills. The importance of competencies such as constructing graphs, reading charts and graphs, interpreting information presented in graphic form and interpolation and extrapolation of information from given data cannot be overemphasized. These competencies are generic to even the lowest level in virtually every one of the fifteen career clusters.

Conclusion

The combined pre-literacy, basic literacy, and career literacy skills represent the competencies and skills essential for enlightened citizens as shown by mathematics education research and other literature. These skills are determined by the needs of society at a given time and must be constantly reviewed and modified as the times indicate. The 1973 NCTM report on mathematical competencies includes the following paragraph in their conclusions:

An enlightened citizen is qualified for employment. Employment opportunities are changing and will change both in nature and in requirements of personnel. Surely the degree to which an occupation is mathematically oriented will determine the extent of the basic mathematical skills and competencies required of individuals employed in that occupation. The aggregate degree of mathematical orientation of the job market, in turn, influences what is considered a basic level for all citizens (37).

MATHEMATICS SKILLS

PRE-LITERACY

BASIC LITERACY

CAREER LITERACY

Conservation of Numerousness

- Demonstrates a one-to-one matching between the elements of given equivalent sets
- Recognizes equality and/or inequality of given sets of concrete objects (or pictorial representations)

Counting

- Finds cardinality of a set of concrete objects ($n \leq 20$)
- Given a number ($n < 100$) can state $n + 1$
- Counts by 2's, 5's, and 10's to 100
- Orders a given set of numbers (smallest to largest)

Identification of Numerals

- Identifies the basic units of the decimal numeration system digits 0-9
- Can read and write numerals (symbols) to 100
- Can identify units and tens in a given numeral
- Recognizes concrete representations of halves, thirds, fourths

Identification of Numerals

- Reads and writes numerals to 1000
- Reads and writes money values to \$1000.00
i using digits 0-9
ii using written words
- Identifies place value to thousands place
- Selects fractional parts of a whole (halves, thirds, fourths) and uses correct symbols

Identification of Numerals

- Reads and writes numerals to 1,000,000
- Reads and writes decimal numerals to thousandths
- Identifies place value to millions
- Read and write numerals in fraction and mixed number notation

PRE-LITERACY		BASIC LITERACY	CAREER LITERACY
<u>Operations with Numbers</u>		<u>Operations with Numbers</u>	<u>Operations with Numbers</u>
a. Knows basic facts for all operations (+, -, x, ÷) for numbers 1-9	a. Determine relationships between numbers (<, =, >) and uses correct notation to show relationship	a. Performs all basic operations with positive rational numbers	
b. Recognizes basic operation notation	b. Performs all basic operations using zero	b. Able to change decimal to common fraction and conversely	
c. Solves simple verbal problems using concrete objects (or pictorial representations)	c. Addition and Subtraction (n < 1000)	c. Able to solve "percent" problems - i Finding percent of a number - ii Finding a number when a percent of it is known - iii Finding what percent one number is of another	
	d. Multiplication (2 digit multiplier)	d. Solves problems involving ratio and proportion	
	e. Division (2 digit divisor)	e. Solves problems involving cost, change, discount, and taxes for example - i Sales tax on purchase - ii Property tax - iii Balance a check book - iv Installment buying	
	f. Adding and subtracting using halves, thirds, and fourths		
	g. Finds the "percent of a number" (e.g. 25% off - 20% higher "vest of the Rockies")		
	h. Solves simple verbal problems, i.e. problems involving only one operation		
	i. Solves problems involving the concept of ratio		

PRE-LITERACY		BASIC LITERACY		CAREER LITERACY	
<u>Measurement Without Number</u>		<u>Measurement Without Number</u>		<u>Measurement Without Number</u>	
a.	Distinguishes among geometric shapes	a.	Recognizes triangle, circle, square, rectangle under different orientations in a plane	a.	Classifies angles as acute, obtuse, or right
b.	Classifies given geometric shapes according to given attributes, (e.g. roundness, 4 sidedness, etc.)	b.	Recognizes solids (rectangler, cubes spheres, ellipsoids)	b.	Identifies parts of circles and plane figures (radius, diameter, side, angles)
c.	Orders objects according to measurement attributes (shortest-longest, lightest-heaviest, etc.)	c.	Identifies attributes of plane and solid figures (angles, faces, length, area, volume, etc.)		
d.	Classifies coins according to size, color, (value)				
<u>Measurement with Number</u>		<u>Measurement with Number</u>		<u>Measurement with Number</u>	
a.	Uses ruler to measure length to nearest inch (cm.)	a.	Uses standard measuring instruments (ruler, scale, etc.)	a.	Precision in using standard measurement instruments expanded to appropriate level (e.g. 1/16 inch, millimeter, 1/10 of ounce etc.) and to include liquid measure.
b.	Uses scale to measure weight to nearest pound (kg.)	b.	Find area and volume of given figures using formulae.	b.	Finds perimeter, circumference, area, and volume, by measuring and using appropriate formula.
c.	Covers given region with "unit square" and counts to find area of region	c.	Mastery of time concepts including calendar	c.	Measures angles using protractor.
d.	Fills given space with "unit cubes" and counts to find volume of space	d.	Reads and interprets tables and graphs	d.	Organizes data and determined (calculates) basic statistical measures - range, average mode, median.

PRE-LITERACY		BASIC LITERACY		CAREER LITERACY
<u>Measurement with Number</u> (con't)		<u>Measurement with Number</u> (con't)		<u>Measurement with Number</u> (con't)
e. Tells time to quarter hour		e. Demonstrates map reading skills (location and distance)	e. Constructs and interprets statistical graphs (bar, picture, line, circle)	
		f. Organizes data (frequency, majority, etc.)	f. Demonstrates map reading and rout- ing skills.	
		g. Interprets basic statistical data (average, range, odds)	g. Solves problems related to time, rate, distance, 1 determined distances between cities (given map) 11 finds average rate of speed for a trip	

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